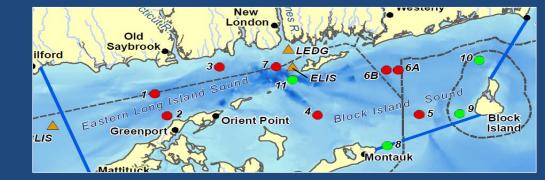


Data Recovery

About half or more data (45 - 90%)



For Moored Stations

Para- meters	Temperature and Salinity near the Seafloor			Currents and Suspended Sediment near the Seafloor			Waves and Currents in the Water Column						
Sensor	CTD (SBE SMP37)			Nortek ADCP & OBS3+ sensor			RDI ADCP						
	Campaign		Total	Campaign		Total	Campaign		Total				
Mooring	1	2	3	Total	1	2	3	Total	1	2	3	Total	
Stn	days				days				days				
DOT1	66	58	57	181	25	29	54	108	66	58	57	181	
DOT2	66	58	57	181	25	27	54	106	66	58	57	181	
DOT3	66	58	57	181	24	32	53	110	0	58	57	115	
DOT4	66	58	57	181	27	34	56	117	66	58	57	181	
DOT5	66	58	57	181	27	30	57	114	66	58	57	181	
DOT6 A/B	66	58	43	167	25	16	44	86	28	16	43	87	
DOT7	49	58	57	164	28	34	27	89	0	58	57	115	
Max Days	66	58	57	181	66	58	57	181	66	58	57	181	
Ful	l or nea	ır-full d	ata (>90	0%)			Full or near-full data (>90%) About one quarter or more data (22.5 - 45%)						

No data





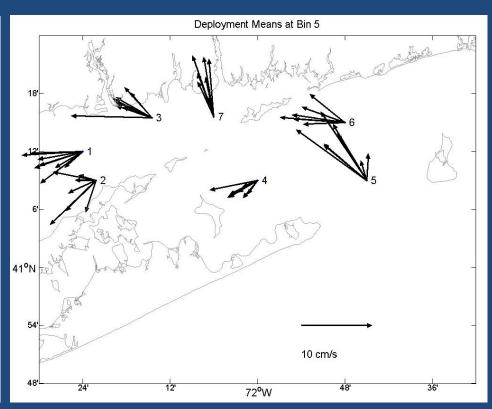


RDI ADCP means at ~3m from seafloor

Deployment Means at Bin 3

10 cm/s

Nortek ADCP means at ~0.6m from seafloor



Mean currents at Bin 3 of the RDI ADCP measurements during Campaigns 1 (green), 2 (red), and 3 (blue).

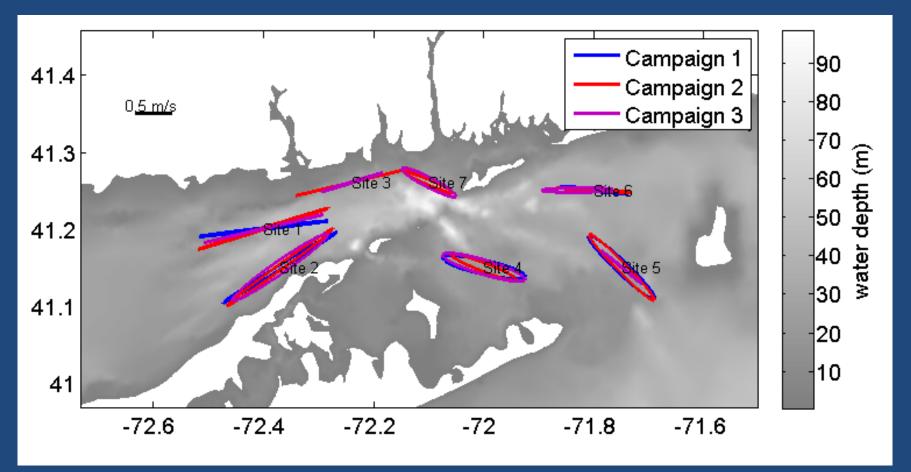
Mean velocity vectors at each moored station from the Nortek ADCP near the seafloor. The velocity scale is shown on graphic.





Tidal Current (M2) Amplitudes

M2 Tidal Constituents

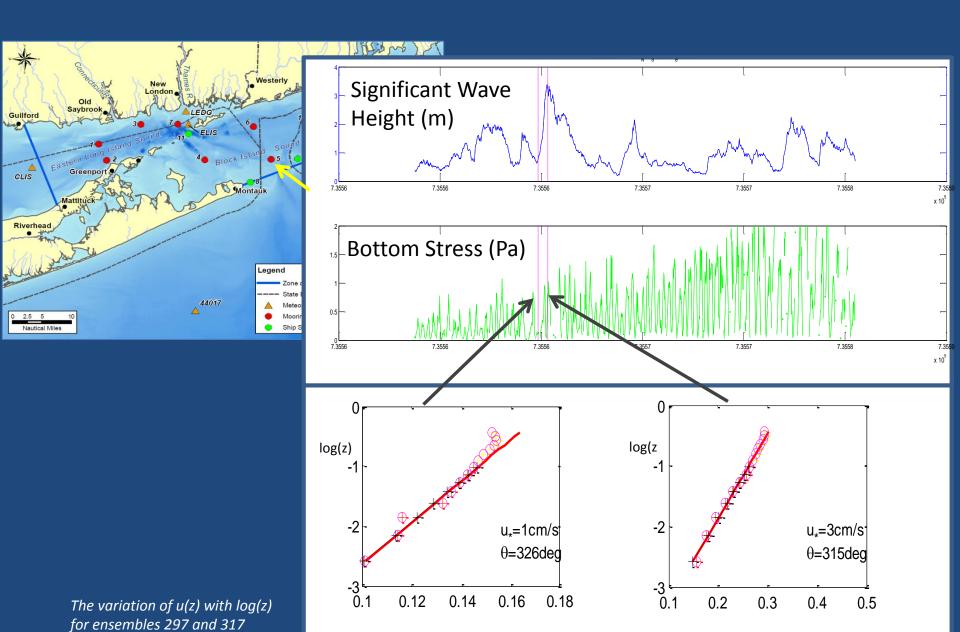


M2 ellipses for depth-average velocities from RDI ADCP measurements from the three campaigns (colors) and for FVCOM model (black) at all seven DOT stations. The grey shading represents mean water depth.



Wave and Stress Measurements







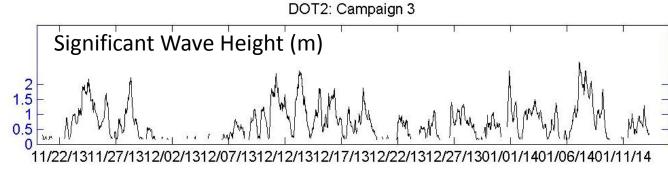
Wave and Stress Measurements

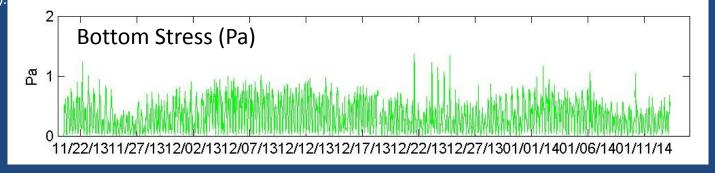




44017

Characteristics at Station DOT2 during Campaign 3: Top: Significant wave height (in m). Bottom Stress.





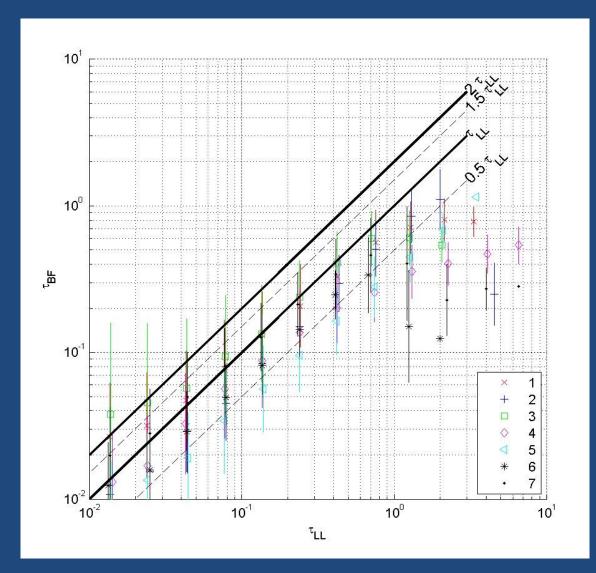




Bottom Stress Drag Coefficient Evaluation

Measurements using the Log Law method (LL) support the use of Bulk Formula (BF) with $C_d = 0.0025$.

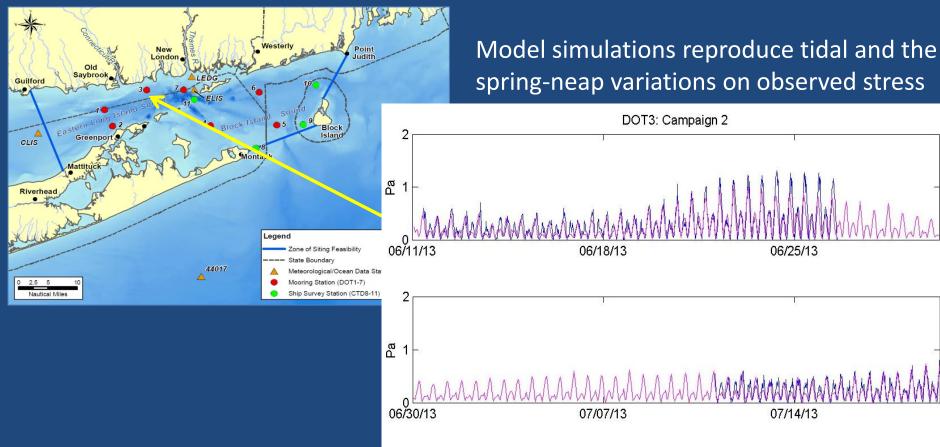
Summary of stress magnitude measurements using the log law and the bulk formula with C_a =0.0025. To suppress the noise inherent in turbulent quantities, measurements were binaveraged. The key shows the stations numbers.



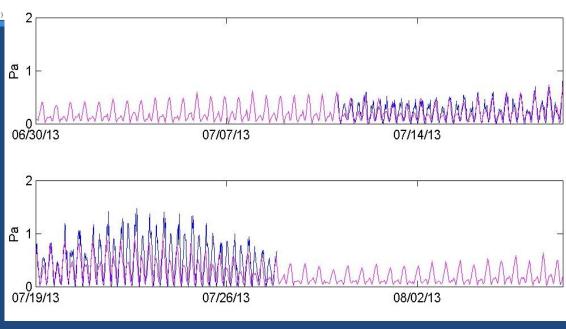








Model-predicted bottom stress at Station DOT3 during Campaign 2 in the summer of 2013 (magenta line). The blue line shows the measured stress using the bulk formula.

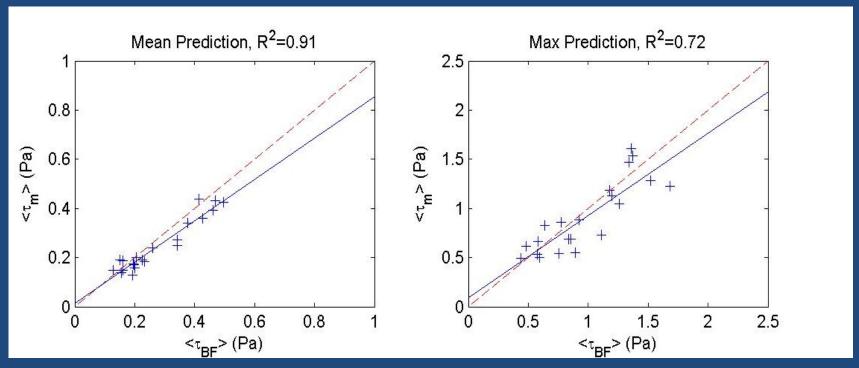






3. Evaluation

- Model and observations agree on the campaign mean and maximum stress magnitudes.
- Model can effectively discriminate between places where the maximum measured stresses are large (>1 Pa) and those where they are smaller (<1Pa).



Left: Comparison of model predicted bottom stress magnitudes and mean bottom stress observed during the three campaigns. Points would all lie on the red dashed line if the model and data were in perfect agreement. The blue solid line shows the ordinary least-squares regression line which has a correlation coefficient of 0.91.

Right: Comparison of the predicted and observed maximum stress magnitudes. The correlation coefficient was 0.72.





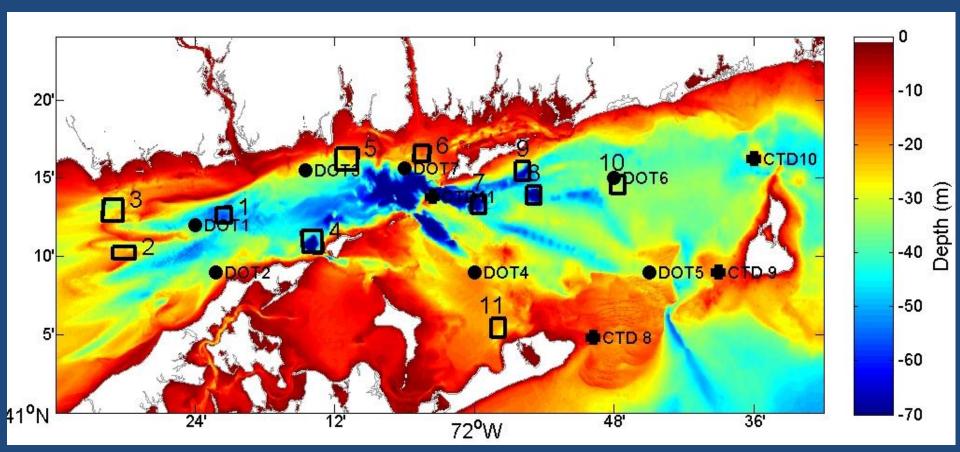
4. Analysis

- Find maximum bottom stress magnitude at each point in the ZSF in the three Campaigns
- Compare values at sites identified in the screening process
- Simulate period of a severe storm (Superstorm Sandy) and compare maximum stress magnitudes





Bathymetry and locations of potential sites

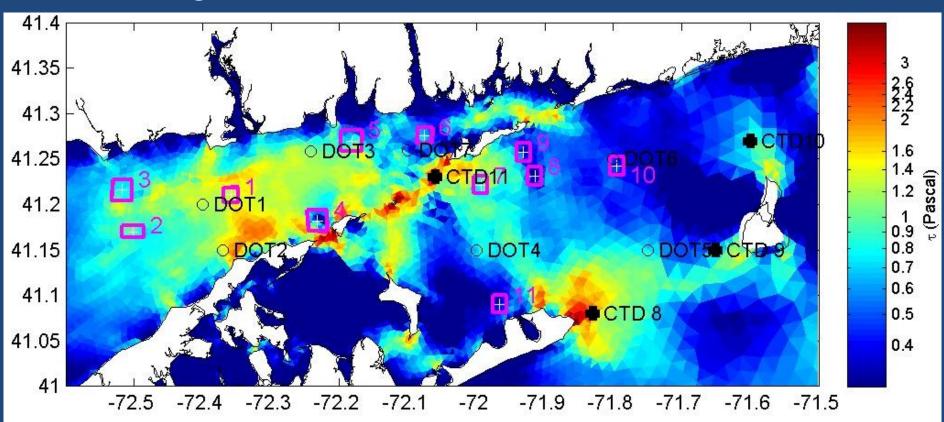


Water depth and 11 potential dredged material disposal sites (open boxes) as identified during the initial screening process. Sites 1 and 6 are the active disposal sites (CSDS and NLDS, respectively). The seven mooring stations ('DOT') are identified by full circles; the four additional ship survey stations ('CTD') are identified by crosses.





- Spatial differences are much larger than seasonal variations
- Stress is high in much of ZSF





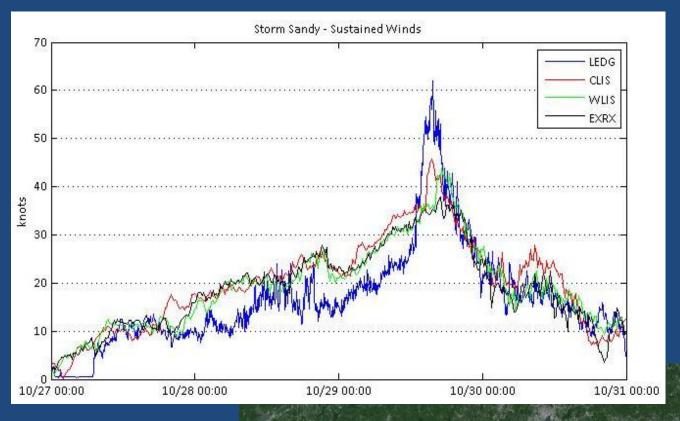


Maximum Bottom Stress (Pa) <u>during Storm Conditions</u> at Potential Dredged Material Disposal Sites

				Maximum Bottom Stress (Pa)			
Poter	ntial Dis	posal Site	1. (spring)	2. (summer)	3. (winter)		
	1	Cornfield Shoals Disposal Site	1.17	1.31	1.24		
SI	2	Six Mile Reef Disposal Site	0.92	1.09	1.00		
	3	Clinton Harbor Disposal Site	0.72	0.71	0.81		
ELIS	4	Orient Point Disposal Site	0.52	0.61	0.48		
	5	Niantic Bay Disposal Site	0.73	0.97	0.84		
	6	New London Disposal Site	0.60	0.70	0.69		
	7	Fishers Island-west	0.79	0.91	0.86		
	8	Fishers Island-east	0.49	0.51	0.39		
BIS	9	Fishers Island-center	0.39	0.50	0.38		
	10	Block Island Sound Disposal Site	0.49	0.63	0.44		
	11	North of Montauk	0.31	0.31	0.34		



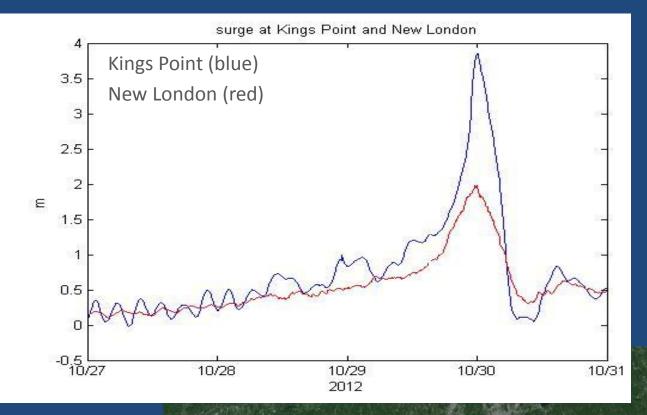




Superstorm
Sandy:
Sustained
Winds







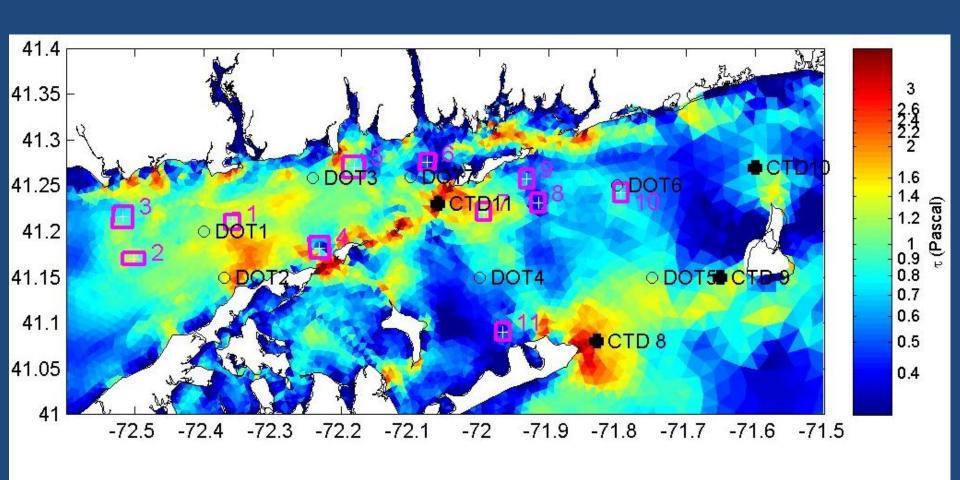
Superstorm
Sandy:
Storm Surge







Superstorm Sandy created higher maximum bottom stresses in some areas







			Superstorm Sandy Conditions		
		Potential Disposal Site	Bottom Stress		
			(Pa)		
	1	Cornfield Shoals Disposal Site	1.16		
ELIS	2	Six Mile Reef Disposal Site	1.26		
	3	Clinton Harbor Disposal Site	0.87		
EI	4	Orient Point Disposal Site	0.53		
	5	Niantic Bay Disposal Site	0.99		
	6	New London Disposal Site	0.48		
	7	Fishers Island-west	1.17		
	8	Fishers Island-east	0.46		
BIS	9	Fishers Island-center	0.55		
	10	Block Island Sound Disposal Site	0.73		
	11	North of Montauk	0.39		





Stress Threshold for Erosion on Seafloor:

- Defined as the level of stress at which dredged material in a disposal area will be mobilized
- Depends upon sediment grain size, fraction of clay, volume fraction, level cohesiveness
- Based on a review of the literature, we choose 0.75 Pa as the design threshold





Comparison of Maximum Bottom Stress (Pa) for Potential Dredged Material Disposal Sites in the simulations of the three Observation Campaigns and Superstorm Sandy.

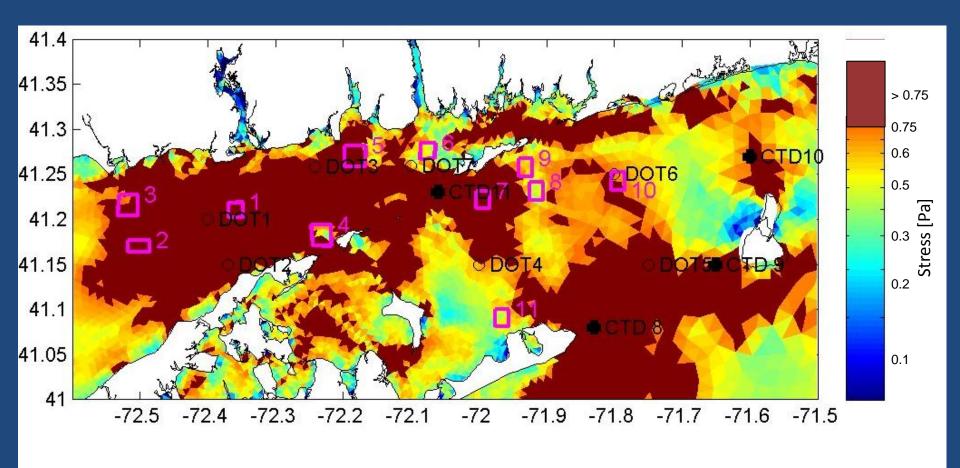
		Pote	ential Disposal Site	Maximum Stress in Simulations (Pa)			
ELIS	BIS	No.	Site Name	Group	Highest Value		
•		1	Cornfield Shoals Disposal Site		1.31		
•		2	Six Mile Reef Disposal Site	>1	1.26		
	•	7	Fishers Island-west Disposal Site		1.17		
•		5	Niantic Bay Disposal Site	0.75.1.0	0.99		
•		3	Clinton Harbor Disposal Site	0.75-1.0	0.87		
	•	10	Block Island Sound Disposal Site		0.73		
•		6	New London Disposal Site		0.69		
	•	9	Fishers Island-center	رم مرد در مرد	0.55		
•		4	Orient Point Disposal Site	<0.75	0.53		
	•	8	Fishers Island-east		0.46		
	•	11	North of Montauk		0.39		







Areas with maximum bottom stress exceeding the 0.75 Pa threshold during the simulation of Superstorm Sandy (screened as a uniform brown layer). Areas with bottom stress below 0.75 Pa are scaled (see color key on the right).





5. Summary (cont)



Sites 1, 2, and 7 (Cornfield Shoals, Six Mile Reef, and Fishers Island - west) have high maximum stresses.

Sites 4 and 10

(Orient Point DS and Block Island Sound DS) show maximum stress below the 0.75 Pa threshold at the center of the site, but have values in excess of 0.75 Pa within the boundary.

Sites 5 and 3

(Niantic Bay and Clinton Harbor) show maximum stresses exceeding 0.75 Pa but less than 1 Pa.

Site 6

(New London DS) is the only site in Eastern Long Island Sound with maximum bottom stress below the 0.75 Pa threshold.

Attachment 4

TRANSCRIPTS OF PUBLIC MEETINGS, RIVERHEAD, NEW YORK DECEMBER 8, 2014

March 2015 Louis Berger

	1		
1		1	SEIS MEETING 12-8-2014
2	SUPPLEMENTAL ENVIRONMENTAL	2	DR. HAY: I think we are ready to
3	IMPACT STATEMENT	3	start. Welcome to this public meeting. Good
4		4	afternoon. Before we start, a couple of
5	Suffolk Community College	5	housekeeping items. The sign-up sheet is
6	20 East Main Street	6	outside. I hope everyone has had a chance to
7	Riverhead, New York	7	sign in at this point. The public rest rooms are
8	3:00 p.m.	8	on the right side down the corridor, both ladies'
9	December 8, 2014	9	room and men's room. Also, please turn off your
10		10	cell phones or put them on vibrate.
11		11	My name is Bernward Hay. I am with
12	SPEAKERS:	12	the Louis Berger Group. We are under contract
13		13	with the University of Connecticut, which is
14	BERNWARD J. HAY, PH.D, LOUIS BERGER	14	under contract to the Connecticut Department of
15	JEAN BROCHI, Project Manager, EPA, Region 1	15	Transportation. We have been assisting the
16	FRANK BOHLEN, University of Connecticut	16	Connecticut Department of Transportation and the
17	GRANT MCCARDELL, University of Connecticut	17	EPA to prepare a Supplemental Environmental
18	AUDIENCE SPEAKERS:	18	Impact Statement for the potential designation of
19	ADRIENNE ESPOSITO, Citizens Campaign for the	19	one or more dredged material disposal sites in
20	Environment	20	open waters. The EPA is the federal lead agency
21	MARGUERITE PURNELL, Fishers Island	21	for this project. In addition to this public
22	BILL GASH, Connecticut Maritime Coalition	22	meeting, there will be another one tomorrow,
23	KEVIN MCALLISTER, Defend H2O	23	which will be held in New London, Connecticut.
24	NEVITA MENULISTER, Detend 1120	24	Today's meeting is designed to
25		25	present findings of the physical oceanography
	3		
1	SEIS MEETING 12-8-2014	1	SEIS MEETING 12-8-2014
2	study that was conducted as part of the	2	just raise your hand or ask me to repeat
3	Environmental Impact Statement. This meeting	3	something.
4	will be informational, and there will be a	4	Anyway, thank you all for coming
5	presentation. Therefore, there is no comment	5	out this afternoon on this wonderful winter day.
6	period, but we do have time for questions and	6	If you haven't been to a meeting before, this is
7	comments at the end of the presentation as well.	7	an EPA meeting, and it is a combined EPA Region 1
8	Ms. Jean Brochi is the project	8	and Region 2. We have several EPA
9	manager of the Ocean and Coastal Protection Unit	9	representatives here. I am Jeanie Brochi, as
10	of the EPA. She will open the meeting, and will	10	Bernward said. Mel Cote, my manager is here.
11	give you a project update. Then this will be	11	Doug Pabst and Pat Pechko from Region 2, and
12	followed by the physical oceanography	12	Alicia Grimaldi, who you met when you first
13	presentation by Frank Bohlen and Grant McCardell	13	signed in, is also from our office in Region 1.
14	from the University of Connecticut Marine Science	14	This is for a Supplemental
15	Department. Again, then we will have some time	15	Environmental Impact Statement for Eastern Long
16	for questions and for comments.	16	Island Sound. The last set of public meetings
17	The meeting is recorded by a	17	that we had in this facility, actually, was in
18	stenographer, and also on audio devices, and the	18	June, June 25th and 26th. Again, the primary
19	transcript will be available, after the meeting	19	focus of this meeting is for the physical
20	at some point, it will be made available to the	20	oceanographic study, and Frank Bohlen will start
21	public on their web site, at the EPA's web site.		that off.
22	With this, Ms. Brochi will open the meeting.	21	
23	MS. BROCHI: The other speakers	22	Again, under the Marine Protection
24	probably won't need a microphone, but I do. Even	23	and Research Sanctuaries Act and the Clean Water
25	with the microphone, if you can't hear me, please		
		24 25	Act, EPA and the Corps of Engineers share responsibility for dredged material management.

5 6 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 1 2 2 screening, and there were site screening criteria Several Corps of Engineers personnel are here 3 3 both general and specific in the Marine today. Under Section 102 of the Marine Protection and Sanctuaries Act, which we 4 Protection and Sanctuaries Act, EPA has the 4 5 5 authority to designate disposal sites for dredged follow. I didn't go into detail here, but I do 6 6 have the presentation that went into detail from material. 7 7 The Long Island Sound Dredge 8 Materials Disposal Site designation was 8 Initially, we had the 11 sites in 9 9 officially, the final designation was in July of Eastern Long Island Sound. Now we are focusing 10 10 2005, and that was for the western and central on six sites, which include Cornfield, New 11 London, Niantic, Orient Point, Clinton and Six 11 disposal sites. The Corp has the authority to Mile Reef. The physical oceanography study that 12 12 select sites on a temporary basis. So Cornfield 13 Shoals and New London disposal sites, which are 13 you are going to listen to the result of and the 14 14 analyses today initiated, the study initiated in the eastern part of the Sound, were selected 15 by the Corps of Engineers, and expire in 2016. 15 with some additional buoy locations, and the green shows the buoy locations, the labels show 16 Here are the disposal sites. You 16 17 can see the Western, Central and this meeting is 17 the historic sites, and the labels that are not 18 focusing on the Eastern sites. Again, our role 18 in yellow show the dredged material disposal 19 19 is to designate disposal sites. In doing so, we 20 develop a site management and monitoring plan. 20 This process kicked off with a 21 Notice of Intent in October of 2012. We have had 21 EPA also has a shared role in reviewing dredging 22 22 several cooperating agency and public meetings, permits, but an applicant would apply to the Corp 23 of Engineers for a federal permit. 23 as I mentioned. One of the last public meetings, 24 We initially write the 24 Sarah Anker's office recommended that EPA and the 25 Environmental Impact Statement looking at site 25 Corp start educational webinars to talk about 7 8 1 **SEIS MEETING 12-8-2014 SEIS MEETING 12-8-2014** 1 2 dredging, the process of dredging and some dredge 2 Assuming that the SEIS recommends 3 3 material equipment. We held one webinar so far, designation on one or more sites, then we will 4 4 and it was on April 3rd, and it was well move forward with the final SEIS and rule making. 5 attended. So we want to thank any 5 That would be no later than December 2016. 6 representatives, if you are here. Thank you. 6 With that, I am going to introduce 7 7 Thank her for us, because that was very well Frank for the physo discussion. 8 attended. 8 DR. BOHLEN: Good afternoon. Can 9 9 If you didn't sign in, please do you hear me? If you can't, speak up. I am Frank 10 so. But if you did, and you want to comment 10 Bohlen. I am a physical oceanographer at the 11 after this meeting, or you have questions, feel 11 University of Connecticut Department of Marine 12 free to send it to the ELIS at EPA.gov E-mail 12 Sciences. I have been working on sediment and 13 13 sediment transport for 45 years. A fair amount system. If you are not on our notification 14 14 system about upcoming meetings, please feel free of that work has been done around dredged 15 to sign up for that. We also have the minutes 15 material disposal sites, dredging and dredged 16 from the meetings, and we will have all the 16 material disposal sites. 17 documents posted on our EPA Region 1 web site. 17 We have seen the evolution of 18 18 The address is listed up there. information over the past 45 years, and there has 19 19 The next step in this process is to been, believe it or not, a substantial evolution. 20 further evaluate the sites, draft rule making, 20 I want to emphasize that we are going to be and a draft supplemental Environmental Impact 21 21 talking about the physical oceanography, physical 22 22 Statement by spring 2015. We will hold oceanography of Long Island Sound, as in physics. 23 additional public meetings at that time, and 23 Not the biological, not the chemical, geochemical nor the political. Physical oceanography. 24 those will be official comment periods on the 24 25 draft, and the draft rule making. 25 We are going to be talking about

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to do by measuring.

SEIS MEETING 12-8-2014 the physical oceanography in the Zone of Siting Feasibility. We will try to define that. By the way, if at any time you don't understand the language, don't be afraid to speak up, because we often tend to speak our own language. It is taken for granted that everybody knows where Staten Island is, sort of thing. Then you come out after the talk, and you find out that nobody knows where Staten Island is. Holy Christmas. So that doesn't work. Don't be afraid to ask the question if you don't understand the language. Physical oceanography in the Zone of Siting Feasibility. Why? Because one of the first questions that is often asked is, is the

Physical oceanography in the Zone of Siting Feasibility. Why? Because one of the first questions that is often asked is, is the stuff going to stay put, and under what circumstances might it not stay put, and if it doesn't stay put, where is it going to go. So it makes sense to begin with the physics. Besides the fact that it is the queen of the sciences, so the remaining sciences are only the handmaidens of the queen.

We are going to speak about the model that is being developed and being used.

Why four? We can't measure all we need to know

at every point through the Zone of Siting
Feasibility. We can measure characteristics at a
number of discreet points, carefully selected
discrete points, and then use that to build a
model that will allow us to really assess on a
much finer spatial scale than we could ever hope

SEIS MEETING 12-8-2014

A model is important today in practically everything we do. We wake up in the morning and we look at the weather forecast, it's a model. We are going to be using a model, a numerical model. Then we are going to evaluate the model. How good are the simulations presented by the model. It will give you some indication of what the results indicate, and provide you with a summary.

The science that explains the patterns of ocean circulation and the distribution of properties such as temperature and salinity. That is where we all started. Nansen, Fridtjof Nansen back in 1900 when physical oceanography really started, the Norwegian school. Somebody tried to figure out what it means in terms of circulation, and what

SEIS MEETING 12-8-2014 all that means in terms of herring. But we go beyond that right now, and we look at currents, circulation of the water, waves, and the effects of those flows on the movement of sediments.

of those flows on the movement of sediments.

Of particular importance within this study, because you are asking me where the stuff is going to go, is why this stuff going to go. It is going to go because you are exerting a certain force on it. We measure that force in terms of force per unit area, which we call stress. We are all stressed at some point. This is stress. Again, capisce? Go back to our friend Sister Sarsaparilla in the fifth grade or

so, and she was telling you about forces, or flow going over a surface. A change in velocity occurs as you approach the surface because you are beginning to exert force on the boundary, and as you do, you might drag it along, and you may

disaggregate it, and you may break it down. So you are going to hear a lot about boundary shear stress, because the boundary is where we are

stress, because the boundary is where we are working, and the shear stress is the force that may affect the form and shape of the boundary.

This is a little primer I studied

SEIS MEETING 12-8-2014 in the past that really doesn't work, but it is one you will see in all the texts. So it is up there for you to take a look at. It really was designed for the next set of terms you are going to hear a lot, namely noncohesive sediments. The general class of noncohesive sediment which I believe we are all familiar with is beach sand, discrete, granular material, with very little binding beyond gravity. I will take questions on it later.

The materials that we deal with are for the most part cohesive. They may be fairly coarse grained, and you can get sand, but they are stuck together by other stuff than simply gravity. It may be the technical term snot, at the interface, a mucilaginous matrix associated with biological activities along the boundary. You can actually stick sand together and cause it to be cohesive. But more typically what we are looking at is finer grain materials than sand. We get down well below the millimeters. We get down to the microns. 63 micron, the breakover between silt and sand. Then you get down to about 4 microns or so and you get into the clays.

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When you get down to the really fine grains, you not only have the possibility of having a mucilaginous matrix, but you also have electrochemical binding, differences in charge of the particles. Those little magnets, they stick together.

When you get down to that scale, and an awful lot of the material we are dredging tends to be fine grained silts and clays that are very cohesive, what you are looking at, in distinction from this picture that you have up here, where it is showing off an individual grain sitting up on top here, as you would with sand, really what you have is a matrix. It is all sort of glued together, and the stress tends to break down the bulk. It doesn't go off grain by grain. It tends to sit there until it was breaks down in bulk failure.

Another thing to consider when you are taking a look at the boundary is the effect of the boundary on the velocity field above the boundary, (language). The boundary affects the velocity field, the flow right over that boundary. You can believe there is something up

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here. As we get closer down to the boundary, we get closer to more and more friction, the flow is going to slow down. That gradient in velocity as we get down closer to the boundary is the stress we are talking about. There are a variety of factors that are affecting it. That is all they are trying to show you here, and you have got a rather complex velocity field. That is the vertical. Here is the velocity coming down to the boundary. You see it over here, (there were two screens along the front of the room), the velocity coming down to the boundary is rather complex because of some effects of the boundary on the flow. Another whole class to deal with that.

We sometimes have panels, and this is the famous Shields diagram showing something about particle characteristics against critical erosion velocity. The only thing you can take from this is there is a significant difference between the gluey, sticky cohesive stuff and the more granular noncohesive stuff. That is really all you need to get off this. We will see more of it as we go along.

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want to call your attention to for part of the discussion at least later, is an interesting variation in this critical shear stress, Tau sub C, from point 48 up to a very high value, 18. This guy is circled out at about three quarters of a Pascal for something like fine sand. As you get finer and finer material, more and more cohesive, the critical stress goes up.

That is sort of counterintuitive. You believe in a kitchen if I have a pile of sand sitting on a counter and I blew on it, not much might move. But if I had a pile of flour sitting on the counter and I blew on it, a fair amount might move.

So she says why is it that the coarse grained stuff actually takes less force than the fine grained stuff. The answer is cohesion, it is stuck together. If you wet up that flour, and if you have played with flour, you know you have got to sometimes scrub your hands pretty good to get rid of it, you will find that it is more difficult to move. So that is a bit counterintuitive, but it is also one of the reasons why you see so much dredged material

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A table summarizing some results, laboratory and field, shows you that as you go from course sands up through progressively finer materials, getting more and more cohesive, you have got a significant change in critical shear stress values. We are looking out here at the stress, at the initiation, it is called the initiation of motion, first motion. We are getting into this in terms of Pascals. You are familiar with pounds per square inch, probably. You may have heard of millibars. That is pressure. We usually hear pounds per square inch in terms of atmospheric pressure. That tends to be a vertical pressure.

This is the same sort of thing, except it is horizontal. Pounds per square inch, force per unit area. We can put it out in a variety of units, but one of the most common units is Pascals. You can Google it up and see what it means. If you care for Dynes per square centimeter, you will find it at the back, and you can convert that to pounds per square inch.

But the game today, we are going to be playing mainly with Pascal, and the thing I

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1 **SEIS MEETING 12-8-2014** 2 sticking around. 3 MR. GASH: Are you taking 4 questions now, or do you want us to wait? 5 DR. BOHLEN: Questions later. If 6 there is something not clear up here, please. We 7 have a selected critical value here, something 8 like three quarters of a Pascal and it goes up. 9 So there are some interesting responses that you 10 can play with. 11 The objective of the physical 12 oceanography study. The first thing is the Zone 13 of Siting Feasibility, understand, is this blue 14 guy right here. 15 It sort of goes from Guilford over 16 to Mattituck, right out here. You have got Long 17 Sand Shoal and a fair piece of the Eastern Sound 18 in here. Montauk to Block, Block to Port Judith 19 is the Zone of Siting Feasibility, ZSF, for this 20 study. The Environmental Impact Statement is 21 built around that. 22 This slide is hard to read on 23 either side. It shows you a number of the 24 potential dredged material disposal areas. A 25 couple of the active ones, the Cornfield and New 1 **SEIS MEETING 12-8-2014**

London. You have got here a number of the historic ones. There are about six historic ones sitting in there, and there are about four new ones in there. You can see that down in the panel on the side here.

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The purpose, stress. Describe the distribution of maximum bottom stress magnitude expected in the zone. Characterize the circulation. Mind you, boundary shear stress is what gets this stuff moving. Then the circulation over the vertical is what transports it away from the initial point of introduction. Also recognizing that some amount of material is going to be entrained in the water column when you dispose of the material. There will be a bit of a cloud. You care about the vertical circulation as well as the boundary shear stress. Acquire physical oceanography data sufficient to calibrate, verify the model. Clear, more or less? Everybody knows where you are, right? Staten Island. You probably have some

sense of the circulation in Long Island Sound, right? If I tell you that it is tidally

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2 dominated, that is probably not too much of a 3 surprise, I would hope. This is a set of 4 stations that were occupied over the course of 5 the Long Island Sound study. It started about 6 1988 and ran intensively in the early 1990s, and 7 it has been going on. A fair number of stations 8 are still monitored by DEEP, and to some extent, 9 DEC. The only one I want to call your attention 10 to is this guy up here, which you can't read, and 11 in fact, I couldn't read. I put a magnifying 12 glass on it to determine that is M3 at the Race, 13 East River to the Race. 14 You recognize that one of the

2 You see that I have got a tidal 3 influence, and I can believe that we can make 4 this may display a monthly variation, and I have 5 got a river influence, and it may display some 6 seasonal variations. We have got some temporal 7 variations in the circulation of the Sound. They 8 show up in water temperature. This is a set of 9 slides that shows you the April, August and 10 December temperature profiles. At the end, here 11 is the East River, more or less, Throgs Neck over 12 here. You get an idea that there is a deep

factors affecting circulation in the Sound is fresh water inflows, that there is a regular seasonality to your fresh water inflows. This, (pointing to next slide), comes from the Connecticut River, which represents something in excess of 70 to 80 percent of the fresh water inflow to the Sound. So you get a feeling for

14 Again, it is all pretty much common 15 sense. You have got to believe there may be a 16 little bit of a time lag, but this afternoon, we 17 are cooling down the water in the Sound. If you 18 wait a while, it is going to get pretty cool out 19 there. Then you are going to warm up Riverhead 20 pretty quick. Coming through Long Island 21 summers, you are going to warm quite fast. You 22 are going to have a big reservoir of heat sitting

seasonality in the temperature profile.

22 the seasonality, peak in April/May, typically, 23 due to snow melt up north. That is the

23 out there, or cold, or absence of that. Temperature, Salinity, that change of fresh water inflow is going to show up in the

24 assumption that there is a snow melt, but that is

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25 fairly typical, and a lull in the mid summer. 20

21 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 2 salinity structures. Temperature-salinity scale, six to twelve hours, and then we drag that 3 3 characteristics affect the density of the water out to the monthly cycle. 4 column. Just like the density of the air affects 4 Let's take a look at a little film. 5 5 atmospheric circulation, the wind, the density of We will stop here for a second. This is not to 6 6 impress you with the graphics, but here is the the water column will affect the circulation of 7 7 study area, right. If you look up on top, you the water column. Now we have tides and we have 8 got this density field operating. This is just a 8 will see a date. This is surface salinity that 9 9 picture of the tidal circulation from a model on you are looking at. 10 the web. If you want to Google it up, you can 10 MS. ESPOSITO: Is that this year, 11 11 take a look at this guy. A little hard to see, October 22nd this year? I can't read it. 12 12 but what is important here is the spatial DR. BOHLEN: This is October 22, 13 variations. Much lower velocities in the western 13 2012, for a period, but the detail is not as 14 sound versus the eastern sound. We have got a 14 important as the nature of the enemy. You are 15 lot of velocity flow through The Race. That is 15 dealing with a system. That is what is going on. 16 what you are seeing right up to here, and you can 16 MS. ESPOSITO: Frank, is that just 17 see fairly low velocities down here. 17 the surface? 18 If I run through a tidal cycle, you 18 DR. BOHLEN: That is the 19 19 surface, that is surface salinity. Of course you can get an idea that it is coming and going. 20 Move it back one, that is coming in. Still 20 can see the Connecticut River coming out here, 21 21 pretty strong flows in the eastern Sound in the and the ebb and the flood sweeping it around. 22 22 flood, and here is another flood, and here we go You can see the variation from higher salinities 23 turning into the ebb. A little stronger on the 23 off shore to progressively lower salinities as we 24 ebb. Fair amount of spatial variation, fair 24 come in. The typical salinity variation east and 25 25 west in the Long Island Sound is about four parts amount of temporal, time, relatively short time 23 1 **SEIS MEETING 12-8-2014** 1 2 per thousand. These guys are in units of tens of 2 3 3 percent, tens. We call it 35 parts per thousand. 4 You might call that 3 and a half percent. 4 5 Salinities are normally marked out in parts per 5 6 thousand. On this guy here, you will see it goes 6 7 7 32, 31, 30, that is 3 percent salt. 8 Oceanographers always deal with 4 decimal points 8 9 9 within a 31.4450. 10 10 That is the system we are dealing

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with, sort of on average. If we keep running it

long enough, actually, and it would take half an

hour to tell you about how the system responded

to Sandy, because October 29th was Sandy. We

This just gives you an idea that

not only are we worrying about spatial variations

in temperature salinity, and some of the temporal

have to care about the waves. Surface waves have

variations that go along with them, but we also

a velocity associated with them that interacts

with the tidal and the density driven velocity

field. So we have to worry about that, and this

is just showing you two areas, one a little north

of Montauk here, and the other sitting over here

just walked by Sandy. Go back to the slide.

SEIS MEETING 12-8-2014 by Orient Point, and some of the wave characteristics as we wander down here. That is all you are looking at here. The significance of the blue and the red in this, we are not talking about that right now. That is actually a model run to compare, observed to a model. But what you are getting out of this is that there is some significant spatial variability in wave heights, as you start marching into the Sound. Again, not terribly surprising because of the sheltering and because of the shallows.

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What is the distribution and spatial variations in the bottom stress, where are the regions in which the maximum stress are the smallest, and where, if the stuff does get stirred up, does it go. Sort of pretty fundamental questions. The model, Grant McCardell.

DR. MCCARDELL: Hello, everybody. I am Grant McCardell, also from the University of Connecticut. I am going to be talking some about the model we have developed to look at distribution of the stresses. You saw an example of the model

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1 **SEIS MEETING 12-8-2014** 2 output just a few moments ago with that movie of 3 the surface salinity. The reason we run models, 4 as Dr. Bohlen stated, is because we are unable to 5 go out there and make measurements over every 6 single space at every single time. So we make 7 some measurements at certain times, at certain 8 locations, and we use those to be able to what we 9 call tune a model. We then have to hope that the 10 model is replicating reality, at least to a 11 certain extent, in order to use the model to make 12 predictions about what might or might not be the 13 current during more extreme events, and in other 14 locations. That is where we have areas. 15 The model that we are using is 16 nested within a bigger model. It is nested 17 within a model of the northeast coast and the 18 northwest Atlantic. It is forced by tides, it is 19 forced by observed flows, so we go and we get 20 historic data, or get the model run from USGS 21 stations. 22 It is forced by climatology, and by 23 "climatology" here, what I am referring to is 24 "what are the average conditions at a given space 25 and date?" So the climatology for Riverhead, New

SEIS MEETING 12-8-2014 York for today's date might be that the average temperature is 35 degrees, and that is what we were using. So that is what we mean by climatology terms.

We also use climatology for the initial conditions. When you run a model, you have got to start somewhere, when we run this model long enough before the study period that is we are using the conditions for that actual period.

What is a model? The model that we use is called a primitive equation model. By primitive equation, we mean that it is based on first principles, it is based on Newton's laws that were developed in the 17th Century by Sir Isaac Newton. Those laws were further expanded to fluid dynamics in the 19th Century. It is a set of equations called the Navier-Stokes equations. Those are very well thought to represent fluid flow. They even model turbulence and all sorts of things. They are very rich sets of equations. They are a rich set of equations

that lend themselves to computer models. They

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SEIS MEETING 12-8-2014 bottom friction non linear, which means that these models behave in a non linear fashion, which means that the models really are a pretty complex source of behavior.

Here is what our grid looks like to the bottom of your right. Again, this is nested within a bigger model that covers the rest of the shelf out here and then up to the northwest Atlantic, and this is our model. It contains about 30,000 triangular elements, each one of which contains 15 depth elements. So we have got a total of about 500,000 volume elements running this model.

In red right there, what I am showing is the area of our study. So red is the area of the study, and here it is to that red area. You can see that this model is made of discrete triangular mesh. It is important to realize that the resolution of this mesh is also the resolution of the output of this model. It is certainly much better than any survey we could ever do. We could not take a ship and survey every single one of those little triangles, nor could we go put buoys in every single one of

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did not lend themselves very well to analytic solutions in the 19th Century, but they have lent themselves very well to be able to use high speed numerical computers to represent these equations, and then simulate the motion of fluids. The same sets of equations are used in ocean models. They are also used in atmospheric models. So when you looked at the weather forecast this morning, it is because someone had run a primitive equation model on the current conditions from yesterday, and extended that to be able to tell you what

tomorrow is likely to be like. In the model, the bottom stress magnitude -- which is what we are interested in here for the purposes of this study -- is computed according to the formula that you see down here. It is Tau equals Rho -- Rho is the water density -- times Cd. Cd is just a constant. We normally take it to be point zero zero two five. It varies somewhat, but spatially, different studies vary. Then that is times the square of the water velocity. So in other words, if I double the water velocity, I increase the stress four fold. This also makes

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bottom that allows us to take measurements of the

whole of the vertical, or at the surface and take

measurements over the whole of the vertical.

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period is March through May. About each one of

everything. The spring period you saw on that

these is on the order of 60 days, you see

33 34 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** Very, very useful tool. 2 2 maybe four times an hour a whole array for a 3 3 This Nortek I said was a little bit couple of thousand samples. So you can get a lot 4 revolutionary in the game. It is what they call 4 of data on the structure of the flow both over 5 5 a pulse coherent acoustic Doppler current the vertical, we are looking for far field 6 6 profiler, meaning that you can make very small effects over the vertical, and in terms of 7 7 measurements. The RDI that sits up on top of the resuspension, the boundary shear stress at these 8 ADCP, that is the upper looking guy, that is 8 points. They are discrete points, and that is 9 9 what you are measuring; water column currents and measuring about once every meter over the 10 vertical. The Nortek measures centimeters over 10 waves, currents near the sea floor, stress, 11 the bottom three quarters of a meter. So really 11 suspended sediment concentration and temperature 12 fine slicing down to the boundary, which is what 12 and salinity. That frame stands about 6 feet 13 we care about. Remember? We really want to get 13 high or so, and about 8, 10 feet triangular. 14 those measurements down to the bottom. Grant 14 When we were out there working on 15 15 showed you the equation, the square of the the frames, changing batteries and so forth, we velocities, the east west velocity and the north 16 had to get out there, so you run a ship out from 16 17 south velocity. We are really able to measure 17 Avery Point to the stations. Along the way, you 18 those accurately right down to the bone, and we 18 take temperature and salinity measurements at a 19 19 can with the Nortek. This thing, (the frame), number of points. This is a conductivity 20 also has a temperature salinity sensor sitting 20 temperature depth profiler, profiling 21 over here, and a couple of probes along here, and 21 conductivity temperature depth, CTD, along with a 22 22 another one here that says OBS, Optical Back series of bottles in here. So as you are 23 Scatter, so we can measure the concentration of 23 lowering it down, you can take discrete water 24 stuff in the water column. 24 samples over the vertical, and bring those 25 This will sample, burst sample 25 samples back. That allows you to calibrate your 35 36 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 instruments. The OBS is an optical sensor 2 recovery, greater than 50 percent. You have got 3 3 a lot of temperature salinity there. You go out looking at what is in suspension. How do you 4 know that it really is telling you the truth? 4 here and you say currents and suspended sediments 5 You draw some water samples, filter them down, 5 near the sea floor. That is that Nortek ADCP. 6 compare them with the OBS. That is what the 6 The pulse coherent guy that is looking at the bottom 75 centimeters or so. You see the blues 7 7 water samples allow you to do. You get your 8 temperature and salinity from that as well. 8 are in the middle guy, lighter blue here and 9 9 Sediment samples. For each station yellow. 10 that we are doing the CTD Cast, we will also get 10 The first time we put this guy out, 11 a sediment grab. We will get an idea of the 11 the manufacturer had claimed a certain life of 12 distribution of the sediment in the study area as 12 the batteries. So we figured we would go out 13 13 once at the beginning and once at the end of the well. 14 14 This is just showing you some of deployment period, change up the batteries. We 15 the ship's track. It doesn't really mean very 15 went out there after about a week or two to check 16 much because yesterday, the track didn't look 16 things out, and the batteries were bad. So that 17 like that, and tomorrow, it probably won't look 17 is why the Campaign One data recovery rate is 18 18 somewhat lower than it was in the other like that again. You get from station to 19 19 Campaigns. station, depending on how the weather goes.

good. You have three Campaigns, one, two, three

The data recovery. This is an

interesting slide. The data recovery is pretty

much blue, which says full or near full data

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Same thing goes for the two zeroes down here for ADCP's. This is now just telling you some of the problems of doing this kind of measurement. These two instruments were sent back to the manufacturer for refurbishment, and sent back all refurbished, ready to go with the

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SEIS MEETING 12-8-2014 wrong firmware. You put it in the fi

wrong firmware. You put it in the field, and you get no data, that sort of thing. But overall when you are taking a look through this, you say the data recovery rates are well in excess of 50 percent, and probably bordering on 80 percent for a lot of the sensors.

DR. MCCARDELL: We did not expect to have that percent. 50 percent was what was anticipated.

DR. BOHLEN: A few years ago, if you got 10 or 20 percent, you would really be feeling good. Just some examples of the observations. This is mean flow, an average, near the bottom. This is the RDI, the ADCP that is looking up. You are 3 meters off the sea floor here, and this is the long term net drift. This is not an instantaneous measurement, it is an average over many tidal cycles.

You can see it here, if you look carefully at these, you will see they are three different colors in every one of these. You can see in general, the near bottom flow will generally drift into the Sound. It is a characteristic estuarine flow.

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You have the higher density, saltier water at the bottom, and it tends to migrate into the estuary, as opposed to the characteristic fresher, lighter surface waters that tend to migrate out. The waters of Long Island Sound are not getting fresher and fresher as the Connecticut River water comes in, so where is it going? Out. You have got a characteristic in at the bottom under the surface, and that is what you are looking at here.

This is now at a particular level, and we are going to come all the way up for you. It is just that they picked 3 meters here. This is the Nortek now, about a half a meter from the sea floor. It is the same sort of thing. You get an idea of the magnitude. The magnitude is shown in here on the order of 10 centimeters a second once again. Capisce? 10 centimeters a second? Are you comfortable with 10 centimeters a second? You don't have to lie to me.

A nautical mile per hour, one knot, nautical mile per hour, 50 centimeters a second. Does that give you a feeling for what 10 cm/sec is? Better? That is a mile per hour, sort of

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like in a car, a little bit more, 6,080 feet, instead of 5,000 and some. So just to give you an idea, 10 centimeters a second as the average drift, pretty slow. 30 centimeters a second is a foot per second. So that is the drift, that is the average drift. You stir this stuff up and it is going to go back and forth, back and forth, back and forth, and it is going to keep marching out at the surface. At the bottom, back and forth, back and fort

This is just showing a little bit about the tidal amplitudes in that these are tidal ellipses for each of the Campaigns. Again, what you are seeing roughly, this is now over the vertical. The M2 is the principal lunar component of the tide. You will see that generally things are acting along the axis of the system, which is about what you would expect. You can get some idea of the magnitude on this whole thing. This is a graphic. That is about a half a meter per second over here. So you get an

idea that you have on the order of a knot or so

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max flows down in here. As you get down further out in here, the velocities go down, which is what you are seeing ad nauseam. You saw it in the first model, you saw it in the project model.

With the wave statistics, one of the things we are looking at here is the extent to which the waves are influencing bottom shear stress. One of the questions is always sensitive to areas that are going to be influenced by the waves. To make a long story short here, what these data are showing, there is a difference. In our bottom stress profiles in here, we are looking at time against the magnitude of the bottom stress. You will see this is the spring/neap monthly cycle, the stress as you are looking at moving up here. Up here is time, and this is wave amplitude varying over the period. What you would like to see, if there was a neat correlation between the two, is the influence of the wave on the bottom stress.

To make a long story short here, probably not surprisingly, there isn't much of a correlation, because the stations are, for the most part, outside of "the wave base," the area

42 41 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 2 that you expect to be influenced by waves. Which shallower. I thought that went without saying, 3 3 makes sense because you want to set a site for right. Closer to shore is shallower. 4 disposal of materials that tends to have as few 4 MS. PURNELL: Is that set at 14 5 5 influences to move this stuff around as possible. feet? Is the boundary set at 14 feet? 6 6 DR. BOHLEN: I don't know. The guy on the bottom is showing 7 7 you a relationship between velocity and the DR. HAY: 18 meters. 8 distance over the vertical, and it is just 8 DR. BOHLEN: 17, 18 meters. 9 showing you there is a difference at the two 9 MS. PURNELL: Thank you. 10 sites as we are coming in here, at the two times 10 DR. BOHLEN: We can argue about as you are coming in here. This is another site 11 11 the 17 or 18, but it is not going to affect it. 12 looking at the same thing, and probably the same 12 This gets a little esoteric for you. This is the 13 answer. 13 plot that Grant, when he was talking about the 14 One of the things I didn't point 14 model formulation, he said he was going to be 15 15 out, and you may have missed on the very first using a formula that had a drag coefficient in slide that had the Zone of Siting Feasibility, is 16 it, and he mentioned just sort of off hand, our 16 17 around the margin of it was a gray border. That 17 drag coefficient, C sub d, is generally on the 18 has been defined by the Army Corp and EPA as the 18 order of . 0025. This was a plot to check out 19 19 area where you are too close to shore, and you whether that made any sense or not. What we are 20 may be more likely subject to wave influence. So 20 taking a look at here is a log plot sitting along 21 21 that is looking pretty good so far from these here. There is a log law down in here, and there 22 22 is a bulk formula on here. If everything on the data. 23 DR. MCCARDELL: Because it is 23 vertical bulk formula, on the horizontal log law, 24 shallower. 24 if everything was fine, it would be laying along 25 DR. BOHLEN: Because it is 25 a single line, a log law. 43 44 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014**

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2 It looks pretty good on this, 3 laying along a single line until you get up in 4 the vicinity of about a Pascal. When you get up 5 to a Pascal or so, that begins to break down a 6 little bit. This is where the complications come 7 in. Why for? Because all sorts of things at 8 this point start influencing the characteristic 9 of the near bottom velocity field, the velocity 10 over the vertical, the boundary layer when you 11 get down to there. When you begin to stir up sediment into the water column, you begin to 12 13 change the relationships that govern the 14 distribution of the velocity over the vertical, 15 the friction characteristics of the flow change. 16 You can also change the pressure distributions at 17 the bottom as they affect the flow field. 18 That is being verified here really 19 as you see, you get up here pretty well, and you

That is being verified here really as you see, you get up here pretty well, and you begin to break off somewhere around, if you can see it, right around here. Then you get off and say how many things are going on. But the long and short of this one is that the measurements using the log law support the use of the bulk formula with a drag coefficient of about .0025,

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SEIS MEETING 12-8-201 up to at least one Pascal.

I thought this was hard to see, and it may be that I am getting color blind as my age passes, but one of the things this is showing you is that model simulations reproduce tidal and the spring neap variations on the observed stress very well. You have got a neap, spring neap variation. Do you understand spring neap? Is that all right?

The monthly variations, twice monthly variations. We are near full moon tide right now. You drive down Route 25 this morning, this afternoon, and high water is pretty near the road. That is not counting what is going to happen when it is going to blow for the next day and a half. We get off the full moon, and the tidal excursion (range) is somewhat reduced. We get back on the new moon, and it is increased. That is the spring/neap cycle. That spring has got nothing to do with May June either.

What you are seeing here is a variation over the course of about 14 days or so of a spring neap cycle. You can see, if you can see it, if the blues and the purples weren't so

45 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 1 2 2 very happy with how well your model can do for close together, that the model is doing an 3 3 you when you are talking about those kinds of excellent job of reproducing the stress that is 4 measured from the array. 4 5 5 DR. MCCARDELL: The model is in MS. PURNELL: Again, that data and 6 6 the prior slide's data, that averages over all red, and the data are in blue. 7 7 DR. BOHLEN: You can see it down seven of those arrays? Is that how you came to 8 at the end in the blue. That is why they dove 8 9 9 off the end down in here. There is no data out DR. BOHLEN: I had forgotten what 10 there. So we got a pretty good feeling for that. 10 I had on this one. Yes, it is. 11 DR. MCCARDELL: Yes, it covers Here, we are looking at a 11 12 12 the stress during the entire Campaign. comparison between the measured and observed 13 again. This is now the model, modeled and 13 DR. BOHLEN: For all seven arrays. 14 14 DR. MCCARDELL: The maximum amount observed or modeled and measured. This is the 15 model and this is the observed, and you can see 15 of stress during the entire Campaign. DR. BOHLEN: Right. One of them, 16 if there was a perfect fit, a one to one fit, 16 17 everything would be laying on this line right 17 I had just one Campaign. Here is the analysis. 18 here. So it is just a slight variation for the 18 Find the maximum bottom stress magnitude at each 19 point in the Zone of Siting Feasibility in the 19 means, these are the mean velocities now. Then 20 for the max in here, it is a little coarser. The 20 three Campaigns, compare the values at sites 21 21 identified in the screening process. That is the R squared is about point 7 in here (the maximum 22 22 sites considered potential disposal areas. To value). It is something over point 9 in the case 23 of the means. But in the world of modeling 23 simulate the period and the characteristics that 24 versus measuring, those correlations are 24 you might expect during a storm, Sandy came to 25 25 excellent. That is a high correlation. You are 47 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 Here is the Bathymetry, water 2 the primary factor affecting the turbulence over 3 3 depths through the study area, and these are the the vertical. We were seeing before that wind 4 stations, DOTs, groups, and the sites. You get 4 and wind waves have relatively little effect on 5 bottom shear stress in the area that we are 5 an idea of what the water depths look like 6 picking. You have got to get much closer to the through the system. Are you comfortable with 6 7 7 beach to find that. that? Pretty deep in the vicinity of the arrays. 8 8 Montauk, - shallow is here. Is that okay? 9 9 Stress values. Here are your 10 10 stresses in Pascals. Reds are three, and that 11 up into Fishers Island Sound or close to Fishers number that we were playing with in that panel 11

So to give you a sense of what the stresses look like, you are within a one and a half Pascals sort of range up in there. You get

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12 Island Sound, you are getting down to your point 13 7 or so. You get out into here, you get down

14 around Montauk, you are up around 2 and behind

15 Montauk.

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conditions we observed through each of the Campaigns; one two and three. You can see this, we are allowed to go through this now and pick out different seasons, different locations. Cornfield is fairly high. That starts dropping down. This is Eastern Long Island Sound, Six Mile Reef, Clinton, Orient Point, New London.

Then we go Block Long Island Sound, outside of Eastern Long Island Sound, however you

Maximum bottom stress during storm

before, point 75 or so, is somewhere down in the blues, down in here. So if we say that a fair amount of the area in the Zone of Siting Feasibility has got fairly high stress, that is what that guy is saying. The one thing that is interesting

is that the spatial differences, if we run this now for each of the Campaigns, and we can go beyond the Campaigns now that we have a model, we can run it every month if we care to, you are much larger than the seasonal variations.

22 going to find that the spatial differences are

23 24 Which sort of makes sense because

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25 you figure that wind and wind waves are probably

49 50 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 want to divide it. Fishers, this is the south 2 me a liar. Again, any time you look at these 3 3 side of Fishers near the deep hole for Fishers. things, you sort of scale them out, what do they 4 Values similar to Clinton. You can sit and play 4 look like, what do they feel like. Again, the 5 5 with this. This is the kind of information that impressive thing about Sandy that made it 6 6 you will have to play with as you go through. memorable was the surge, and the impressive thing 7 7 That just summarizes some of the sites against about Sandy that made it memorable was the surge 8 that plot you had before. 8 down towards New York. In this case, this is 9 9 Kings Point, this is in Long Island Sound. In Sandy. This should come as no 10 surprise, the results from the Sandy analysis if 10 Kings Point, there is a surge up here on the order of 4 meters. We get down to the eastern 11 you lived here during Sandy. You had some winds. 11 12 This is now Ledge Light, tip of Long Island 12 end of things, on the order of one and a half to 13 Sound, west of Long Island Sound and the Bronx. 13 2 meters. 14 You have got some winds at Ledge Light that might 14 So we have a pretty good surge down 15 15 get up to 60 miles an hour. Is that a lot of at our end. It has got a recurrence on the order wind? It is not an afternoon sailing breeze, not 16 of 30 to 40 years sort of a thing. When you get 16 17 around here, but it is a fair amount of wind. 17 down to the western end of Long Island Sound and 18 But this is not the 100 year storm event, wind 18 New York Harbor, you have got a recurrence 19 19 wise. It is just sort of a husky afternoon interval of once every 1,000 to hundreds of years 20 sailing breeze. You can get a 50 knot blow 20 or so. That is what got the attention, besides 8 21 nearly every year, every other year. 21 million people, to Sandy. 22 22 MS. ESPOSITO: We are supposed to Superstorm Sandy, our analysis of 23 get 50 mile per hour winds tomorrow. 23 that, running it in, created higher maximum 24 DR. BOHLEN: We might get 50 mile 24 amount of stresses in some areas, and most of 25 25 per hour winds tomorrow, so there you are, call those areas were closer to shore, sitting in 51 52 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 here. If you ran this guy against the slide I 2 This is now the Superstorm Sandy 3 3 showed you earlier, which was the results of the conditions, and again, you are running these up 4 model that is running through every year, and no 4 against what we had before, and you see New 5 London along on the eastern Sound and Cornfield, 5 Sandy in that, you won't see an awful lot of 6 Six Mile. Six Mile is out in the water a little difference. You will some spatial variability in 6 7 7 bit more, a little bit higher. These numbers areas where you would expect to see more reds up 8 aren't terribly much different than what we saw 8 along the shallows. It makes sense. 9 before. In fact, in some areas, you might see 9 Sandy was, for the most part, a 10 the stresses a little bit lower because of the 10 southeasterly storm here. It went northeasterly 11 complexity of the interaction of the flow. as it got close. Southeast, this way, east this 11 12 We define a stress level based on 12 way. That's when you have got your good winds 13 historical data and literature. Based on a 13 and you have got some good waves and you have got 14 review, we chose point 75 Pascal as something of 14 some good stresses acting against, you all know 15 a design threshold. You can make it higher, 15 what, residual flows. You stuff a lot of water 16 you can make it a little bit lower, you can sit 16 down at the western end of the Sound, and it has 17 and argue about it but this is a work in 17 got to go somewhere. It comes back out. It is 18 progress. But you have the data to progress, to 18 the interaction of the tidal wave with the 19 do that sort of testing. The model is looking 19 outflow of water that produces some interesting 20 pretty good. The results of the model are 20 turbulence, and increases the chance of change in 21 impressive. 21 boundary shear stress. So the picture here is 22 Critical shear stress, if you 22 fairly complicated, but it didn't turn everything 23 listened to what I told you before, the manner of 23 red at all, is the moral of this story. But I 24 setting up a critical shear stress for cohesive 24 suppose you could find me a higher energy storm. 25 materials is complicated. It depends on grain 25 Start looking around for it.

53 54 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 size fraction at play, volume fraction, how many 2 Sound, it covers a fair number of sites in the 3 burrowing organisms you have working that are at 3 Eastern Sound, with the exception of the Fishers Island site down here. This is the kind of 4 the sediment mound, how long the sediment has 4 5 been down for consolidation. All of that affects 5 information that is coming in, that we can bring 6 bulk density, affects erodibility, and bulk 6 into the site selection designation. 7 density is very important in here. 7 So, sites one, two and seven, 8 The comparison of the maximum 8 Cornfield Shoals, Six Mile and Fishers Island. 9 amount of stress for potential dredged material 9 Everybody knows where they are, and Fishers 10 disposal site simulation in the three observing 10 Island west, have high maximum stress. Four and Campaigns and Sandy, throwing in Sandy, came out ten, this is Orient Point and Block Island, the 11 11 12 with this set of numbers. Cornfield one. Six Block Island Sound site. Maximum stress is below 12 13 Mile was next. Fishers Island west, this is 13 at the center of the site, but have values in 14 south of Fishers Island near the deep hole, was 14 excess of point 75 Pascals at the boundary. So 15 15 next. Then Niantic Bay and Clinton Harbor. You there is a spatial variation on the scale of a run down this guy, the New London disposal site 16 mile or so. Grant already told you that the 16 17 is point 69. All of these guys here; Block 17 resolution of the model might be on the order of 18 Island, New London, Fishers Island Center, 18 a quarter of a mile or so. 19 Orient, Fishers Island East and North of Montauk 19 Sites three and five, Niantic Bay 20 are less than the defined critical threshold, 20 and Clinton Harbor, maximum stresses, but less 21 point 75. 21 than one. The stresses are above point 75, but 22 22 What this guy is, is just a graph less than one. If you want to really hold me to 23 of areas where the maximum amount of stress 23 point 75, you can make your one, you can argue 24 exceeds point 75. To give you an idea that it 24 about a quarter of a Dyne or so, a quarter of a 25 covers a fair number of the sites in the Eastern 25 Pascal or so, the issue gets interesting. The 55 56 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 1 2 New London disposal is the only site in the 2 current velocities and unstable nature of 3 3 Eastern Sound with a maximum stress level below sediments at and in the vicinity of NLDS, and the 4 point 75. We saw that. Thank you. Questions? 4 placement of the material from this proposal that 5 DR. HAY: Before you have any 5 contains large volumes of that very fine silt, 6 questions, state your name, please, for the 6 adverse effects are anticipated at the site, 7 record, and also your affiliation. 7 adjacent areas as a result of the dredge material 8 MR. GASH: I am Bill Gash, 8 disposal activities. Can you comment on that at 9 9 Connecticut Maritime Coalition. Referencing back all? From what I am seeing from your 10 10 presentation with the Pascals and the disposals, to one of your earlier slides when you were 11 talking about shear out there, I have a letter 11 once the material has fallen, there is going to 12 from the State of New York objecting to 12 be some dispersion as they are falling. But as 13 consistency certification for dredge projects 13 they get near bottom, everything pretty much 14 taking place in Mystic. 14 settles down to less than point 75 shear in 15 I just want to be clear on 15 Pascals. 16 something. They state in their letter that 16 DR. BOHLEN: I really can't 17 sediments associated with that project were 17 comment on it because I don't have the sediment 18 comprised almost entirely of fine grained, very 18 data to look at. But seemingly the statement, at 19 small silty particles. I would imagine those are 19 least the first part of the statement that you 20 the same fines that you are talking about. 20 read, flies in the face of what I said about the 21 21 DR. BOHLEN: What fines? erodibility of the materials that are 22 MR. GASH: That all stick 22 progressively more cohesive. As you get down 23 together, they are all glued together. 23 into the silt range of sediments, below 63 24 DR. BOHLEN: Yes, yes. 24 microns, the sediment, a sediment mass is very, 25 MR. GASH: They said given the high 25 very cohesive, and tends to get probably more

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1	SEIS MEETING 12-8-2014	1	SEIS MEETING 12-8-2014
2	cohesive, will get more cohesive as you add more	2	base, the channel from the mouth of the river up
3	clay particles.	3	to the submarine base. If you look, it is being
4	The problem with any one of these	4	put into dredge by clamshell dredge and put into
5	about diagrams is they show you a single grain	5	2,000 cubic yard hopper barges. The barge would
6	size. If I picked up that stuff out of my bucket	6	go out and they would open the bottom door and
7	and I said we did sediment grabs, full-on grabs	7	down goes the stuff.
8	at each of the stations that we were doing CTD	8	We would go down after a while, I
9	casts at, it would be shmuck on the deck. It	9	am not going into going down, but we would go
10	would be quite cohesive and clay like. When you	10	down after a while for a swim. Any number of
11	get an analysis, you find there is a range of	11	pieces of that stuff on the bottom retained the
12	particle sizes. So you might say the mean grain	12	teeth marks from the clamshell bucket. When you
13		13	drop that stuff in the water, there is a gravity
	size is 50 microns. But you have got a lot of	14	flow. It goes down like a brick, vertically, and
14	stuff that is down to two, and you may have a	15	it retains its cohesive character until lobsters
15	little bit of stuff, because we do the grain		
16	size, distribution by mass, so a few big	16	drill holes in it. That is another story.
17	particles can skew the mean a lot.	17	DR. HAY: Any other comments, any
18	Most of the sediments that we are	18	questions?
19	familiar with in Mystic River are exceedingly	19	MS. PURNELL: Marguerite Purnell.
20	cohesive. This is all I can tell you. As far as	20	DR. HAY: Do you want to state your
21	the barge goes, that is another whole story. 45	21	affiliation.
22	years ago had us diving on the New London	22	MS. PURNELL: Fishers Island.
23	disposal site. The sea story in that is that	23	The information that is presented today, is it on
24	this was material that was being dredged from the	24	the web site yet?
25	Thames River for the channel up to the submarine	25	DR. BOHLEN: No.
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1	SEIS MEETING 12-8-2014	1	SEIS MEETING 12-8-2014
2	MS. PURNELL: Will it be posted	2	wondering whether or not you have looked at the
3	on the web site as one of our presentations?	3	consistency of the data and the findings as of
4	MS. BROCHI: It will, and when we	4	yet.
5	post information, we are going to send an E-mail	5	DR. BOHLEN: I am not exactly
6	notification so everybody knows that it will be	6	sure what you are asking. Because as I showed
7	available.	7	you, I think, you are going to expect a fair
	MS. PURNELL: Because there is just	8	amount of difference in the transporter regime in
8 9	a lot of material. I could ask you 40,000	9	the central and western Sound, where we have
10	questions and it is not really productive for the	10	worked before, but not on the siting study. Me,
11	other people who are here.	11	not on the siting study.
12	DR. BOHLEN: You could try one.	12	I have worked on other parts of the
13	MS. BROCHI: She already asked	13	Sound, so there is a significant difference in
13	·	13	Sound, so there is a significant difference in
15	one	14	the transport system in the Central Sound
	One. DP ROHI EN: That is okay. Sha	14	the transport system in the Central Sound,
	DR. BOHLEN: That is okay. She	15	Western Sound versus the Eastern Sound.
16 17	DR. BOHLEN: That is okay. She can ask one other question.	15 16	Western Sound versus the Eastern Sound. MS. PURNELL: I concur.
17	DR. BOHLEN: That is okay. She can ask one other question. MS. PURNELL: I appreciate the	15 16 17	Western Sound versus the Eastern Sound. MS. PURNELL: I concur. DR. BOHLEN: You can believe it
17 18	DR. BOHLEN: That is okay. She can ask one other question. MS. PURNELL: I appreciate the physical oceanography component to it, and there	15 16 17 18	Western Sound versus the Eastern Sound. MS. PURNELL: I concur. DR. BOHLEN: You can believe it just from an energetic standpoint, you saw all of
17 18 19	DR. BOHLEN: That is okay. She can ask one other question. MS. PURNELL: I appreciate the physical oceanography component to it, and there is a lot of meat in there to really think about.	15 16 17 18 19	Western Sound versus the Eastern Sound. MS. PURNELL: I concur. DR. BOHLEN: You can believe it just from an energetic standpoint, you saw all of those arrows, the blue arrows, the white arrows
17 18 19 20	DR. BOHLEN: That is okay. She can ask one other question. MS. PURNELL: I appreciate the physical oceanography component to it, and there is a lot of meat in there to really think about. Have you made any effort to correlate that with	15 16 17 18 19 20	Western Sound versus the Eastern Sound. MS. PURNELL: I concur. DR. BOHLEN: You can believe it just from an energetic standpoint, you saw all of those arrows, the blue arrows, the white arrows we showed you on the model. Then of course there
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17 18 19 20 21 22	DR. BOHLEN: That is okay. She can ask one other question. MS. PURNELL: I appreciate the physical oceanography component to it, and there is a lot of meat in there to really think about. Have you made any effort to correlate that with the prior physical oceanography that was done in the prior designation for Western Long Island	15 16 17 18 19 20 21 22	Western Sound versus the Eastern Sound. MS. PURNELL: I concur. DR. BOHLEN: You can believe it just from an energetic standpoint, you saw all of those arrows, the blue arrows, the white arrows we showed you on the model. Then of course there is the matter of it being open to the world ocean out there from the southeast. It is a much more
17 18 19 20 21	DR. BOHLEN: That is okay. She can ask one other question. MS. PURNELL: I appreciate the physical oceanography component to it, and there is a lot of meat in there to really think about. Have you made any effort to correlate that with the prior physical oceanography that was done in	15 16 17 18 19 20 21	Western Sound versus the Eastern Sound. MS. PURNELL: I concur. DR. BOHLEN: You can believe it just from an energetic standpoint, you saw all of those arrows, the blue arrows, the white arrows we showed you on the model. Then of course there is the matter of it being open to the world ocean

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for the siting feasibility as well. I was just

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MS. PURNELL: The comparison is

62 61 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 germane in the sense that there was a large chunk 2 MS. PURNELL: The data point that 3 3 of data in the physical oceanography report that was closest to the New London dump site, you 4 dealt with the Eastern Long Island Sound. I 4 based some of your findings on that. Where is 5 5 apologize if that did not come across in my that related to the position of the current 6 6 question. outline of the dump site? Is it in it or is it 7 7 DR. BOHLEN: Anything that dealt to the northwest or is it to the southwest? 8 with the Eastern Long Island Sound we have seen. 8 Given the resolution of the slide, it is hard to 9 Of course, the other thing is we did the report 9 figure. 10 that is in the Long Island Sound volume on the 10 DR. BOHLEN: Why don't we look on here as to exactly where it is. I will put 11 physical oceanography of Long Island Sound. We 11 the slide up and show you. 12 saw some of the slides from that report up here. 12 13 So we are looking at all of that, and that will 13 DR. MCCARDELL: I should add that 14 all be brought together. I think the thing that 14 the seven sites that we used for the surveys were 15 15 is impressive on this from the standpoint, again, chosen to represent the maximum variability that from the history of disposal in the Sound is you 16 we would see within this entire domain as an 16 17 have got more site specific measurements in this 17 attempt to get the model as good as we could. 18 study than you had in any other study area. 18 They were not chosen to represent any specific 19 19 There were seven frames out there, site, because we are legislated to be able to 20 and the effort to tie all that together, and 20 consider all possible sites. If we give undue 21 21 verify, calibrate and redesign the model has been credence to one site, we would have measurements 22 22 substantial, leaving you with a very powerful at one site and not others. 23 tool to be used for any use out there, really. 23 MS. PURNELL: Thank you. 24 It is a substantial foundation to resolve the 24 DR. MCCARDELL: I hope that 25 25 issue. explains a little bit. 63 64 1 **SEIS MEETING 12-8-2014** 1 **SEIS MEETING 12-8-2014** 2 MS. PURNELL: Thank you. 2 MS. BROCHI: We will share the 3 3 DR. HAY: Thank you. Other information, but we don't know the dates. Again, 4 questions? 4 whenever anything is posted on the web site, we 5 MR. MCALLISTER: Kevin McAllister, 5 will notify you ahead of time. While this physo 6 Defend H2O. That was very thorough. Thank you, 6 presentation is fresh in your mind, we will have 7 Doctor. Forgive me if I am missing something, 7 it available probably next week. We will send 8 but this component with the physical 8 out notification and have the presentation up, so 9 oceanography, we are really focusing on 9 yes. It is a multi faceted process, so it has 10 dispersal, the biological implications as 10 many components going on, and we have contractors 11 defined, I guess, at least in part with the 11 putting it together as we speak. 12 environmental consequences. Was that another 12 MR. MCALLISTER: As I understand, 13 part? Am I missing something? 13 if I am not mistaken, was it the environmental 14 DR. BOHLEN: No biology. 14 consequences document that seems to be the bulk MR. MCALLISTER: No biology. Of 15 15 of the biology? That is at least what I saw so 16 course, certainly I understand that part, but 16 far as being represented. Is that correct? 17 where is the biology? 17 MS. BROCHI: I am not sure what 18 MS. BROCHI: This is one part of 18 you mean by "environmental consequences." 19 the site screening. This is the physo component. 19 DR. HAY: Do you mean the SEIS, 20 There is a biological component as well. 20 the Supplemental Environmental Impact Study? 21 Biological characterization will be done combined MR. MCALLISTER: No, there was 21 22 with this physo model to model sediment transport 22 another document that I had viewed, environmental 23 23 consequences document. 24 MR. MCALLISTER: Will you be back 24 MS. BROCHI: I am not familiar 25 in town to share this information with us? 25 with the environmental consequences document, but

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1	SEIS MEETING 12-8-2014	1	SEIS MEETING 12-8-2014
2	if you remember it or you can reference it, send	2	the attendees here via E-mail?
3	an E-mail to any of us, actually, or ELIS@EPA.gov	3	MS. BROCHI: Sure.
4	e-mail, and we can get back to you.	4	MR. MCALLISTER: Because a couple
5	DR. HAY: The environmental	5	of those slides that were identified went by very
6	consequences document will be part of the SEIS.	6	quickly.
7	MR. MCALLISTER: Chapter five,	7	DR. BOHLEN: I'm sorry, a couple
8	environmental consequences.	8	of the slides
9	MS. BROCHI: All right. I	9	MR. MCALLISTER: A couple of the
10	thought you were looking at something.	10	slides that identified the presenters and who was
11	MR. MCALLISTER: Thank you.	11	being represented today, that went very quickly.
12	MS. BROCHI: There is also a no	12	I didn't get names and contact information.
13	action alternative as part of this effort. So it	13	MS. BROCHI: Sure, we will get
14	is looking at sites, but is also looking at what	14	that out. We will do that in the notification
15	happens if there is no site.	15	when we post the information on the web site.
16	DR. HAY: Okay then. Other	16	MR. MCALLISTER: Thank you.
17	questions, comments?	17	DR. HAY: The names of the
18	DR. BOHLEN: We are pretty easy	18	presenters is also on the agenda.
19	to find. BOHLEN@UCONN.EDU, or you can just take	19	A SPEAKER: Just an anonymous
20	a look at the University of Connecticut and see	20	question. Who is responding to the ELIS@EPA.gov
21	the faces in here. If there are questions, we	21	address?
22	are happy to answer them.	22	MS. BROCHI: Several of us at the
23	MR. MCALLISTER: May I make a	23	Region 1 office.
24	request with respect to our sign in? Would it be	23	DR. HAY: Thank you. Other
25	possible to provide some contact information to	25	questions?
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	SEIS WILLTING 12-0-2014		
,	MS_ESPOSITO: Adrienne Esposito	$\begin{vmatrix} 1 \\ 2 \end{vmatrix}$	CERTIFICATION
2	MS. ESPOSITO: Adrienne Esposito,	2	CERTIFICATION
3	Citizens Campaign for the Environment. Just for	2 3	CERTIFICATION
3 4	Citizens Campaign for the Environment. Just for clarity, the University of Connecticut is	2 3 4	CERTIFICATION
3 4 5	Citizens Campaign for the Environment. Just for clarity, the University of Connecticut is contracted out by the EPA to do this work?	2 3 4 5	CERTIFICATION I, Robert J. Pollack, a Notary
3 4 5 6	Citizens Campaign for the Environment. Just for clarity, the University of Connecticut is contracted out by the EPA to do this work? DR. BOHLEN: No.	2 3 4 5 6	
3 4 5 6 7	Citizens Campaign for the Environment. Just for clarity, the University of Connecticut is contracted out by the EPA to do this work? DR. BOHLEN: No. MS. BROCHI: They are contracted	2 3 4 5	I, Robert J. Pollack, a Notary
3 4 5 6 7 8	Citizens Campaign for the Environment. Just for clarity, the University of Connecticut is contracted out by the EPA to do this work? DR. BOHLEN: No. MS. BROCHI: They are contracted for the project, and the contract is through	2 3 4 5 6 7	I, Robert J. Pollack, a Notary Public in and for the State of New
3 4 5 6 7 8 9	Citizens Campaign for the Environment. Just for clarity, the University of Connecticut is contracted out by the EPA to do this work? DR. BOHLEN: No. MS. BROCHI: They are contracted for the project, and the contract is through Connecticut DOT, not directly to the EPA.	2 3 4 5 6 7 8	I, Robert J. Pollack, a Notary Public in and for the State of New York, do hereby certify:
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1	SEIS MEETING 12-8-2014	
2	CERTIFICATION	
3		
4		
5		
6	I, Robert J. Pollack, a Notary	
7	Public in and for the State of New	
8	York, do hereby certify:	
9	THAT the foregoing is a true and	
10	accurate transcript of my stenographic	
11	notes.	
12	IN WITNESS WHEREOF, I have	
13	hereunto set my hand this 8th day of	
14	January 2014.	
15		
16	2/1. F. D. D. M. 1.	
17	They follow	-
18	ROBERT J. POLLACK	
19		
20		
21		
22		
23		
24		
25		

Attachment 5

TRANSCRIPTS OF PUBLIC MEETINGS, NEW LONDON, CONNECTICUT DECEMBER 9, 2014

March 2015 Louis Berger

12/0//2		T done wieeting
1		
2		
3	SUPPLEMENTAL ENVIRONMENTAL IMPACT	
4	STATEMENT(SEIS) TO EVALUATE THE POTENTIAL	
5	DESIGNATION OF ONE OR MORE DREDGED	
6	MATERIAL DISPOSAL SITE(S) IN EASTERN	
7	LONG ISLAND SOUND	
8		
9	DECEMBER 9, 2014	
10	3:08 P.M.	
11		
12	FORT TRUMBULL	
13	90 WALBACH STREET	
14	NEW LONDON, CONNECTICUT	
15		
16		
17		
18		
19		
20		
21	BRANDON HUSEBY REPORTING & VIDEO	
22	Reporter: JACQUELINE V. McCauley, RPR, CSR LICENSE #40	
23	249 Pearl Street	
24	Hartford, CT 06103 (860) 549-1850	
25	(860) 852-4589	

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Page 2
                                                                                                                  Page 4
     APPEARANCES:
                                                                 region. So the EPA is the lead agency from the
2
                                                                 Federal side for this project.
                                                             2
     BERNWARD J. HAY, PH.D.
3
     PRINCIPAL ENVIRONMENTAL SCIENTIST
                                                             3
                                                                                   Parallel to this meeting there was
     THE LOUIS BERGER GROUP, INC.
                                                                 another meeting yesterday in Riverhead in New York,
                                                             4
     117 KENDRICK STREET, SUITE 400
     NEEDHAM, MASSACHUSETTS 02494
                                                             5
                                                                 and today's meeting will focus on the findings of a
 5
     (781) 707-7482
                                                             6
                                                                 physical oceanography study that was conducted for
     bhay@louisberger.com
                                                             7
                                                                 this Environmental Impact Statement. This will be
     W. FRANK BOHLEN, Ph.D., Professor
     UNIVERSITY OF CONNECTICUT DEPARTMENT OF MARINE
                                                             8
                                                                 presented by the University of Connecticut, Frank
 8
     SCIENCES
                                                             9
                                                                 Bohlen and Grant McCardell, and it will be an
     1080 SHENNECOSSETT ROAD
9
     GROTON, CONNECTICUT 06340
                                                            10
                                                                 informational meeting. So as a result, there won't be
     (860) 405-9176
                                                            11
                                                                 any specific comments or any specific comment period.
10
     walter.bohlen@uconn.edu
11
                                                            12
                                                                                   The meeting will be introduced by
     GRANT MCCARDELL, Ph.D.
                                                            13
                                                                 Ms. Jean Brochi. She's the project manager with EPA
12
     UNIVERSITY OF CONNECTICUT DEPARTMENT OF MARINE
     SCIENCES
                                                            14
                                                                 for the Ocean and Coastal Protection Unit, and she
     1080 SHENNECOSSETT ROAD
                                                            15
                                                                 will provide a project status to see where we are in
     GROTON, CONNECTICUT 06340
     (860) 405-9171
14
                                                                 this process, and we have a 50-minute presentation by
                                                            16
     Grant.mcardell@uconn.edu
15
                                                            17
                                                                 Frank and Grant, and after this the floor will be open
     JEAN BROCHI, PROJECT MANAGER
16
                                                            18
                                                                 for questions and comments.
     OCEAN AND COASTAL PROTECTION UNIT
17
     EPA NEW ENGLAND, REGION 1
                                                            19
                                                                                   The meeting will be recorded by a
     5 POST OFFICE SQUARE - SUITE 100
                                                            20
                                                                 stenographer and also an audio recording device, and
18
     BOSTON, MASSACHUSETTS 02109-3912
     (617) 918-1536
                                                            21
                                                                 the transcript of the meeting will be made available
19
     brochi.jean@epa.gov
                                                            22
                                                                 to the public later on EPA's Web site. So with that,
20
21
                                                            23
22
                                                            24
                                                                                   MS. BROCHI: Thanks, Bernward. I
23
24
                                                            25
                                                                 probably need a mic. So of all of the speakers you
25
                                                     Page 3
                                                                                                                 Page 5
1
                 (The hearing commenced at 3:08 p.m.)
                                                                 will hear today I am probably the one that needs a
2
                      DR. HAY: Welcome to this public
                                                             2
                                                                 mic. So if I talk too fast or you can't hear me, just
3
    meeting. Thanks for coming out on this lovely balmy
                                                             3
                                                                 raise your hand. I will repeat or I will stop.
4
    afternoon here. So before we start, a couple of
                                                             4
                                                                                   Again, I'm Jean Brochi from EPA
5
    housekeeping measures. We don't have a microphone so
                                                             5
                                                                 Region One, and I just wanted to introduce a few folks
    if you have difficulty hearing, please move to the
                                                                 that are in the room as well with me. They're members
6
                                                             6
7
    front. There are lots of seats up in the front.
                                                             7
                                                                 of our cooperative agency group, and it includes Brian
                                                                 Thompson, George Wisker from DEEP. Joe Salvatore from
8
                      Secondly, the bathrooms are outside
                                                             8
    just outside the hallway. Not outside the building.
                                                                 Connecticut DOT in the back. We've got Todd Randall
9
                                                             9
10
    The sign-in sheet, I hope everybody had a chance to
                                                            10
                                                                 from the Corps of Engineers, Mark Habel from the Corps
11
    sign in. Also, if you want to make a comment at the
                                                                 of Engineers New England. We have New York DEC and
12
    end of this presentation, please also sign in. There
                                                            12
                                                                 DOS representatives as well as EPA Region Two folks
                                                            13
13
    is a sign-in sheet there, although there will be an
                                                                 that came to last night's meeting in Riverhead, New
14
    opportunity to ask questions that you may not
                                                            14
                                                                 York.
    anticipate at this point.
15
                                                            15
                                                                                   So you're here, because you are
16
                      Finally, please turn off your
                                                            16
                                                                 interested in the Eastern Long Island Sound
   cellphones or any other kind of audio devices so that
17
                                                            17
                                                                 Supplemental Environmental Impact Statement, and,
18
   we don't get interrupted or put them on vibrate. My
                                                            18
                                                                 again, I'm representing EPA Region One. So Bernward
19
   name is Bernward Hay. I'm with The Louis Berger
                                                            19
                                                                 already went through the agenda. We will have Frank
20
    Group. We're under contract to the University of
                                                            20
                                                                 Bohlen and Grant McCardell show results of a physical
                                                            21
21 Connecticut, which is under contract with the
                                                                 oceanographic study.
22 Connecticut Department of Transportation, and we're
                                                            22
                                                                                   So if you haven't been to previous
23 working together for the DOT and the EPA for the
                                                            23
                                                                 meetings, we had a few introductory meetings on this
24 evaluation of potential dredged material disposal
                                                            24
                                                                 process, and this has been going on since 2012. This
    sites in open waters in the Eastern Long Island Sound
                                                                 meeting is going to be a summary of some of our
```

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Page 6
                                                                                                                   Page 8
    responsibility and really just an update on the
                                                                  sites such as New London and Cornfield where they are
    process, and then I'm going to give it to the
                                                                  so different in characteristics.
3
    University of Connecticut folks.
                                                              3
                                                                                    So the initial screening process
                      So EPA and the Corps of Engineers
                                                              4
                                                                  started with 11 sites, and of those sites they
5
    share responsibility for dredged material. EPA
                                                              5
                                                                  included some historic disposal sites and the active
6
    through the Marine Protection Sanctuary, Research and
                                                              6
                                                                  disposal sites. For the historic sites those were
7
    Sanctuaries Act, Section 102, has the authority to
                                                              7
                                                                  sites that we knew had some dredged material disposal
8
    designate dredged material disposal sites. The Corps
                                                                  at some point in time. Most of them were in the 40s,
                                                              8
9
    has, under the Ocean Dumping Act, Section 404 has the
                                                              9
                                                                  and that was what the Corps of Engineers gave us for
                                                                  their official record.
10
    authority to select disposal sites.
                                                             10
11
                      There's a difference. The
                                                             11
                                                                                    So the 11 sites we initially
12 designation that EPA would use for dredged material
                                                             12
                                                                  screened, and they're listed on the bottom here.
13
   sites is long term. We both manage and monitor sites.
                                                             13
                                                                  Active sites are included in that, and then from that
14
    EPA, when we designate a site, we issue a site
                                                             14
                                                                  group we narrowed it down to Cornfield Shoals disposal
    management monitoring plan, and that's also a shared
                                                                  site, Six Mile Reef, Clinton Harbor, Orient Point,
15
                                                             15
                                                                  Niantic and New London, and those sites are still
16
    responsibility that we partner with the Corps on.
                                                             16
17
                      Now, for permits, as you know,
                                                             17
                                                                  being evaluated.
18
    that's directly to the Corps of Engineers, and EPA has
                                                             18
                                                                                    So for the physical oceanography
    authority for the testing, to review the testing and
                                                             19
                                                                  study you can see -- in the yellow block you will see
20
    make determinations on suitability. So the history --
                                                             20
                                                                  the names of some of the historic sites and then -- it
                                                                  would be great if this worked, but -- there we go.
21
    a little history of the disposal sites.
                                                             21
22
                      You know that in 2005 EPA entered
                                                             22
                                                                                    DR. BOHLEN: No, here.
   into an Environmental Impact Statement and designated
                                                             23
                                                                                    MS. BROCHI: Thank you.
   Western and Central Long Island Sound. This is a
                                                             24
                                                                                    DR. BOHLEN: That's me.(referring to
   supplemental for the eastern part of The Sound only,
                                                             25
                                                                 a laser pointer)
                                                      Page 7
                                                                                                                   Page 9
1 and the sites that are part of this effort include the
                                                                                    MS. BROCHI: Listen. Don't take my
                                                              1
2 Cornfield Shoals site and New London site, and both of
                                                              2
                                                                  steam. You are coming up next. There we go. So the
3 those sites were selected by the Corps of Engineers.
                                                              3
                                                                  yellow is historic, and the bluish white are the
   And the two sites, Cornfield and New London, expire
                                                              4
                                                                  active sites, and what you are looking at is the
5
   December 2016, and here are the sites.
                                                              5
                                                                  disposal sites in red, and then for the green are the
6
                                                                  buoys that were placed for this physical oceanographic
                      So you have Central and Western and
                                                              6
    then the focus here is for Eastern, New London and
                                                              7
                                                                  study that was conducted by UConn, and these black
8
   Cornfield. So, again, EPA's role in dredging is to
                                                              8
                                                                  lines right here, I think Frank will go into more
    review the permits, designate disposal sites. We
                                                              9
                                                                  detail, is the zone of siting feasibility, which was
9
10
    promulgate the regulations. We develop site
                                                             10
                                                                  established for the Environmental Impact Statement.
11
    management monitoring plans, and then we manage the
                                                             11
                                                                                    It's a busy slide so I will keep it
12
    sites with the Corps of Engineers. So the initial
                                                             12
                                                                  up for a minute. So the process again, we started out
13
    approach to this effort was to look at site screening,
                                                             13
                                                                  the process October 16, 2012 with the Notice of
14
   and we looked at five general criteria and 11
                                                                  Intent. Several folks had come to that meeting. We
                                                             14
    specific, and all will lead to what we had done in the
                                                                  had an official comment period for that Notice of
                                                             15
16
    first EIS.
                                                             16
                                                                  Intent, and since then we have had several public
17
                                                             17
                      These are site selection criteria
                                                                  meetings as well as cooperating agency meetings.
18 that are in the Marine Protection, Research and
                                                             18
                                                                                    At one of the June meetings, it was
19
    Sanctuaries Act, and so what we cover for some of this
                                                             19
                                                                  June 25 and 26, a representative from Sarah Anker's
20
    information is biological resources. We will be
                                                             20
                                                                  office requested that we try to reach out and do some
21 looking at conflicting use. We will be looking at
                                                             21
                                                                  more education. So EPA Region One and Region Two
22 sediment environment as well as physical conditions,
                                                             22
                                                                  hosted a webinar on dredging, dredged material,
23 and one of the aspects that was so most interesting to
                                                             23
                                                                  dredged material equipment, and that was April 3, and
24 EPA and what you will hear more about later on is the
                                                             24
                                                                  that was well attended. I'm not sure if some of you
    physical conditions and the sediment transport at
                                                                  folks were in there. I haven't looked at the sign-in
```

Page 10 Page 12 very familiar with models. We wake up to the results 1 sheet. 2 of models on your weather forecasts. We live with So if you are new to the process or 2 you are interested and you haven't received models, and they're modeling everything from your 3 3 voting preferences to what you eat and what you don't notifications, please, again, you can e-mail me 4 directly, I'm Jean Brochi, or you can e-mail the 5 eat sort of a thing. 6 elis@epa.gov e-mail address, and we will add you to 6 So you understand models at least in the distribution list, and we will also send out 7 7 concept. The model is just that, one man's view of 8 notifications whenever we're going to have a meeting, 8 what the system is, how it functions, and that can be 9 whenever we're going to post something on the EPA Web 9 less than perfect. So what we try to do is, to the 10 site. 10 extent possible, to verify the results of the model, 11 The EPA Web site address is right 11 and to do that we take a series of measurements. Not 12 here, and the minutes from the meetings, the 12 as many as we might like to get, not as long as we 13 documents, the studies will all be uploaded onto that 13 like to get them. You talk to scientists. You guys 14 Web site. There are people writing. I'll just leave 14 are always cursing the scientists. They're saying, 15 this on for a few minutes. 15 damn it, we always want more data. 16 Okay. So the next step draft, 16 But we get a fairly representative 17 environmental, Supplemental Impact Statement, and 17 set of data and use it to calibrate a model. That 18 rulemaking in the spring of 2015. We will at that 18 will give us information on a much smaller, spatial 19 point have additional public meetings for an official 19 scale, time temporal scale, than we could ever hope to 20 comment period on that document. And then if the SEIS 20 do by taking direct measurements. That's the model. 21 recommends a designation of one more or sites, we will 21 We will talk to you a little bit 22 issue a final SEIS and rulemaking by December 2016. 22 about how we go about evaluating, the instruments that That's all I have. Thank you for coming and Frank is we're going to be using, and then what the results 23 up next. I will give you back your laser. 24 look like, what the model tells us about the currents 25 DR. BOHLEN: Good afternoon. I'm 25 that may affect the dispersion of materials that are Page 11 Page 13 1 Frank Bohlen. I'm a physical oceanographer on the in the water column either resuspended from the bottom 2 staff at the University of Connecticut Department of 2 or entrained when you dispose of a couple of cubic 3 Marine Sciences. Physical oceanographer. I ain't no 3 yards of material in a dump, okay? 4 biologist. That's what that means. The physics of 4 And then the boundary shear stress. 5 the ocean. And I'm here to talk about the study of 5 If the stuff gets to the bottom and sits there under the physical oceanography of the zone of siting normal circumstances, under what condition might that 6 6 7 feasibility. 7 stuff start to move around, okay? And then we will 8 It's important to realize what the 8 summarize the results. talk is not. We're talking about the physical 9 Let's start out with a little bit of 9 10 oceanography, circulation, currents, waves, and the 10 the physical oceanography. I told the gang yesterday 11 factors that affect the movement of materials. You 11 that it's only right that we start with the physics of 12 are going to hear a lot about boundary shear stress. 12 the system, because physics is, after all, the queen 13 of the sciences, and everything else is simply 13 We hear a lot about stress these days. This is 14 boundary shear stress, the force that's going to be handmaiden to the queen, okay? So physical 14 exerted on the bottom. And if the material fails, the oceanography, the science that explains the paths of 15 16 material, because of that force loading, may be 16 ocean circulation, distribution of a property, blah, 17 blah, blah. You can read it. 17 transported. So that's the physics of the process 18 18 that we're going to be looking at. But of particular importance within 19 Physical oceanography of the zone of 19 this study are the factors governing boundary shear 20 siting feasibility I just told you the why of it. The 20 stress. Boundary shear stress. If we had a better 21 how of it. We just can't go out and measure 21 rug, we could get the rug moving, okay? The force 22 everything we want to know about every point in the 22 that's exerted, a horizontal force that's exerted on 23 field. That's a fair amount of area. You saw it on 23 the bottom because of a gradient in the velocity as we

24

24 the earlier slide. So the best way to do that is to

25 build a numerical model of the system. And we're all

approach the bottom. We have some wind movement over

this floor here. If you can believe it's moving here

```
Page 14
                                                                 film, mucilaginous matrix that's on the bottom. Kind
1 pretty uninterrupted, and as it gets closer down to
    the floor, the flow is more and more influenced by the
                                                                 of gooey-looking stuff. You can see it. On shellfish
3
                                                                 it's not uncommon at all, okay?
    floor.
                                                             3
                      So there is some frictional drag on
                                                                                   So what we tend to deal with is an
4
                                                             4
5
   the velocity as it gets down to the bottom. That
                                                             5
                                                                 assemblage of particles that we class as being
6
    gradient and velocity from the free stream value to
                                                             6
                                                                 cohesive. This sort of picture, simple picture you
                                                                 have back here really applies to the class of
7
    the boundary value produces a force on the bottom,
                                                             7
8 horizontal force, a force per unit area, and the units
                                                             8
                                                                 sediments that you are all familiar with in terms of
9
    we're going to be talking about are Pascals. You can
                                                             9
                                                                 beach sand. That's a good example of sediment. But
10
   go out and look it up, Pascals. You are familiar with
                                                            10
                                                                 it's okay when you start talking about drag on the
    pounds per square inch. You may have heard of Dynes
11
                                                            11
                                                                 bottom, and drag, of course, retards the flow, builds
12 in your physics class way back when. This is just
                                                            12
                                                                 up that force that we were just talking about, the
13
   another version of that force. And then we have a
                                                            13
                                                                 shear stress that particles can be moved.
14
    force per unit area, a shear, a horizontal force.
                                                            14
                                                                                   The bottom also influences the near
15
                      You hear of pounds per square inch,
                                                            15
                                                                 bottom velocity in a variety of different ways. In
16
   and as a vertical force through the atmospheric
                                                            16
                                                                 this case they're showing you how a sand wave field,
17
    pressure. This is just a horizontal version of that
                                                            17
                                                                 nice, rhythmic sand waves, you have seen them off the
18
   same sort of thing. By the way, we speak our own
                                                            18
                                                                 beach maybe when you're laying-floating, you're facing
    language. We tend to speak our own language, and
                                                             19
                                                                 down in the water and you are sort of hanging there,
20
    sometimes we take for granted that everybody knows
                                                             20
                                                                 you can see the waves coming and building little sand
21
    what that word means.
                                                            21
                                                                 waves, ripples in the bottom.
22
                      But on occasion we find -- on more
                                                            22
                                                                                   The velocity gets quite complicated
   than one occasion we find that's not so. Don't be
                                                                 over a structure like this, and you will see a number
                                                             23
24 afraid to say wait a minute. There are no silly
                                                             24
                                                                 of instances in the study of the velocity field that
   questions. So don't be afraid to say wait, wait,
                                                             25
                                                                 we're looking at. We're interested in that, because
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Page 15 1 wait, wait, wait a minute on that for clarification. 2 For substantive response we have to wait till the end 3 of it. 4 So of particular importance within 5 this study are the factors governing boundary shear stress, because it might affect the movement of sediment. This is a very simple picture (slide) 8 that's not entirely appropriate, but it's one you often see in the textbooks when they talk about the 9 10 forces acting on a sediment particle. 11 Now, why isn't it entirely 12 appropriate? Because they're showing you discrete particles sitting here. Here is a sand particle 13 14 sitting in the presence of a number of other sand particles. A bunch of billiard balls laying on each other, marbles, right? Got Bee-Bees? Pick a size. 17 Got it? Not entirely appropriate, because the 18 sediments that we deal with tend to be in structure 19 quite a bit more complicated. 20 They're not simply one particle or 21 another particle held together by gravity. They tend 22 to be one particle, another particle quite small held

together by lots of different gluing factors, gluing

24 factors such as electrochemical binding. The magnetic

attraction between the particles, or a biological

Page 17 that's what's going to affect the boundary shear stress displays quite complex characteristics. The famous diagram, the Shields diagram, the only reason I put this up here is to show you that there is a class of sediments that is cohesive, a class of sediments that is noncohesive, and they're going to display different response characteristics to a given velocity field, and it's going to vary as a function of particle size. The velocity of the shear stress is buried in this parameter, okay? So you can see there's a difference between cohesive, and maybe it's clearer when you look at something like this in tabular form where I'm only going to emphasize this -- what does that say? I can't quite see it. Stress at the initiation of motion. Stress at the initiation of motion. The stress that it's going to take just to get that particle to start rolling along.

And you can see here this is in Pascals, as I said. That if you are dealing with course sand, you may have a value of 0.48, and it's interesting. It's counterintuitive that as the grain size goes down so medium, fine, very fine, course silt, medium silt, fine silt, and beyond that would be

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Page 16

Page 18 Page 20 with, there's some field data to back that up. 1 clay, and you can see here in terms of grain size, the But I 2 diameter in millimeters, you are starting about a half want to show you this again to reinforce this cohesive 2 3 millimeter. component when you begin to think about how these 3 You ever calibrate the sand? You mounds of sediments are affected by a flow. 4 5 sit on a beach, you know, what you feel good about. 5 Okay. Here we are. The objective 6 There are people that do that. If you sit on a beach 6 of the physical oceanography study is to take a look 7 in England -- of course, if you are a Brit, you can 7 at the distribution of maximum bottom shear stress 8 sit on golf balls, and they figure that's a very nice through the zone of siting feasibility. It runs from 8 9 afternoon on the beach, okay, the cobble, the typical 9 Guilford, western boundary, Montauk to Block, Block to 10 British cobble beaches. But around over here if it 10 Point Judith, pretty good patch of water, and, you 11 gets too fine, you stand up and you sort of have all 11 know it to be, I know most of you that are out there, 12 the sand stuck to your back. You don't like that 12 a moderately dynamic patch of water. 13 either. 13 I'll show you some depths in a 14 So it's about quarter of a 14 couple minutes. These are the stations that are being 15 millimeter or a half millimeter sand. It's what you 15 looked at, okay? You just heard about them, and there 16 see on a lot of beaches, and there are a variety of is a variety of them sitting up here. There are only 16 17 sands when you go along Fisher Island Sound's coast 17 two active, the Cornfield and the Fishers Island, the 18 beaches. You will see a variety of sand sizes. 18 Eastern Long Island Sound, sorry, New London site and 19 That's just to give you -- you've got to develop a 19 Cornfield. 20 feel for this stuff, okay? You got to -- it's 20 There are a number of historic sites, and there are 3 or 4 -- I think there are the 21 cohesive like bring it in here and slop it on the 21 22 table. 22 1, 2, 3, 4 new sites that are on there I picked out, 23 Counterintuitive, he says. What's okay? To characterize the circulation, that's the 23 that mean? Most folks tend to think of transport in 24 water column characteristics, we're looking at how the 25 terms of grain sizes simply. So they have this idea 25 water column moves, and acquire enough physical Page 19 Page 21 1 that since it's more difficult for me to blow sand off oceanography data to support the verification of this 2 the table than it is to blow flour off the table, 2 numerical model that we're going to be using really to 3 right? Can't you see it? Flour, okay? Makes a hell 3 look at transport characteristics in detail, the study 4 of a mess. That if we have fine grained sediment, will. 4 that stuff must move more easily than if we have 5 That's a mess (referring to a coarse grain sediment, not true, and it's not true for slide). The only reason I show you, Long Island 6 7 a variety of reasons. 7 Sound, these are the old DEP stations over the years 8 But to begin with, and the simplest 8 since the early '90s, and I wanted to point out M3. one for you to understand is, wet that flour. On your It's important down here. You can't read M3, but it's 9 9 10 countertop make a mess for mom. Wet the flour. You 10 in The Race just off Fishers Island, because -- in a 11 got a nice gooey mass of stuff. You got to wash it 11 minute it will show up. 12 off your hands, okay? When that stuff gets wet, it's 12 You recognize that there are a 13 cohesive, extremely cohesive. And when I go (blow 13 number of factors that govern circulation in Long 14 sounds), I get it on the floor before I get that stuff 14 Island Sound. Most of us think of the tides. Comes to no surprise there, right? Take a look out the 15 to move, okay. 15 16 So that's what they're trying to get 16 window, and you got a fair idea of tides going. You 17 through to you is that the simple relationships 17 go for a sail, and you are influenced by the tides. 18 between grain size and transportability you got to 18 Your front yard is influenced by the tide today if you 19 revise -- a lot of people have to revise their 19 took a look there, okay? 20 thinking, okay? 20 But there is also the matter of 21 21 fresh water inflows. Fresh water inflow show this Now, out of this the only reason we 22 put a red box around this we sort of picked a range in 22 regular seasonal variability with a peak discharge

23

24

23

the three quarters of a Pascal, you will see more of

24 this later, as the level that we're looking at is sort

of the critical level. The material we're playing

value typically in April/May. So we can expect to see

some amount of seasonality in fresh water inflow. The

fresh water inflow in combination with the temperature

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Page 22
                                                                                                                 Page 24
1 can affect water column densities, and the water
                                                                 of currents in the eastern Sound. The Race area is
2 column density, just like the atmospheric the air
                                                                 moderately energetic, okay? That guy's on the ebb.
   density that influence high and low pressures and
                                                                 It's decided not to like us (slide show malfunction).
    influence winds, will influence circulation in the
                                                                 I don't know. Well, if it was working, we turn it
                                                             4
5
    waters.
                                                                 around and show it going the other way, okay, and you
6
                      So now you have tides coming and
                                                             6
                                                                 are going to see a significant amount of spatial
                                                                 variation in it, and it will -- if it doesn't -- there
7
   going, yin and yang, and you have possibly some
                                                             7
8
   density-driven components as well associated with
                                                             8
                                                                 you go, okay? You can plug that in and play with it,
9
    temperature and salinity. It shows the seasonality.
                                                             9
                                                                 get an idea that there is a significant spatial
10
   The seasonality result looks something like this.
                                                             10
                                                                 component to the tide. There is a significant time
11 These are three profiles along the axis of The Sound.
                                                            11
                                                                 component to the tide, okay?
                                                            12
12 Here is M3 sitting down in here, okay? You start down
                                                                                   Now, just to impress you with all of
13
   at the end at Throgs Neck, more or less, and you can
                                                            13
                                                                 that, can we impress you with the technology that's
14
    see, if we look at April, August and December, that
                                                            14
                                                                 possible today or not. Can we shut it down? (set to
   there is, in terms of water temperature, some evident
                                                                 run a video showing surface salinity distributions
15
                                                            15
16
    differences in the vertical structure.
                                                                 from a computer model)
                                                            16
17
                      You see much more stratification in
                                                            17
                                                                                   (Whereupon, there was a discussion
18
   the summer. Surface waters are warmer. Bottom waters
                                                            18
                                                                                    off the record.)
19
    are significantly cooler. That makes for some
                                                            19
                                                                                   DR. BOHLEN: It's nothing you don't
20 differences in terms of vertical exchange, and you
                                                             20
                                                                 know. That's the other thing that's sort of
21 have heard about it in terms of hypoxia and the like,
                                                            21
                                                                 frightening about school and education, right? If you
22 but you can also believe that the seasonality that you
                                                            22
                                                                 just stop for a minute and think about it, you heard
   are looking at here from April, August and December,
                                                                 it in kindergarten or somewhere. You just sort of
   the differences in temperature -- go out there right
                                                             24
                                                                 brighten this up.
25 now, the water temperatures are less than they were in
                                                            25
                                                                                   So what I'm telling you about
                                                    Page 23
                                                                                                                 Page 25
    the summer. Go out there yesterday, they were less
                                                                 circulation in Long Island Sound in general
    than they were last weekend sort of thing. It's
                                                             2
                                                                 characteristics you probably know pretty well. Speak.
3
   cooling down. It might influence the density.
                                                             3
                                                                                   MR. ALLYN: You don't have --
4
                      We go along and take a look at
                                                             4
                                                                                   COURT REPORTER: Sir, what's your
5
   salinity, it's a little more subtle. But, again, you
                                                             5
                                                                 name?
   are going to see this is higher salinity waters, okay,
                                                                                   MR. ALLYN: Lou Allyn. Do you have
                                                             6
    the shelf waters, and you are going to see some
                                                             7
                                                                 a slide that in the future maybe you can talk about
8
   differences in the extent of intrusion when it starts
                                                             8
                                                                 how many people you have working on this project with
                                                                 you, what the organization of the staff is?
9
    coming in.
                                                             9
10
                      This guy is April. We got a lot of
                                                            10
                                                                                   DR. BOHLEN: Yeah. Jim O'Donnell is
11 fresh water coming out so The Sound, greater body of
                                                             11
                                                                 the principal investigator, he's not here today,
12 The Sound is somewhat fresher. You come into the
                                                            12
                                                                 myself, Grant, we have another post-Doctoral
13
    summertime, and this guy in here, this will vary not
                                                            13
                                                                 investigator, and we have two technicians who are on
14
   only seasonally but year to year depending on what the
                                                            14
                                                                 the project.
15
    wind condition looks like.
                                                            15
                                                                                    Video beings to run
16
                      Just real quick. You know this.
                                                            16
                                                                                   This is a model run if you look up
17 This is on our Web site (referring to a series of
                                                                 in the top, it says 10/21, and it's just real quick
                                                            17
                                                                 running through a tidal cycle and higher salinity
18 slides). You can take a look at this. If you want to
                                                            18
19
    play with it, you can just run the cursor. But I only
                                                            19
                                                                 water out here, okay? Lower salinity water back in
    show you this to impress you with the fact that there
                                                             20
                                                                 here. Outflow of the Connecticut River, okay.
   is a significant spatial variability in the velocity
                                                             21
21
                                                                                   And if you keep running this, and we
22 field in Long Island Sound, and, again, most of you
                                                            22
                                                                 could run this, but we don't have enough time to run
23 know it.
                                                             23
                                                                 it -- I saw they gave us a deadline of time -- you
24
                      You don't see much in the way of
                                                             24
                                                                 could run this right on through Sandy, which was
   currents in the western Sound. You see a fair amount
                                                                 10/29. This is 2012, okay, and beyond, because the
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Page 26
                                                                                                                  Page 28
                                                                  can deploy it till the batteries run out. We can get
    Sandy effects in the system, you pulse it, and then
    the system responds over the course of four or five
                                                                  a month or even 60 days worth of data, and we can do
3
                                                                  that at one location with a broad-reaching study like
    days.
                                                              3
4
                       So the storm occurred on the 29th,
                                                              4
                                                                  this. We can even do it at seven locations, but we
5
    and you might look to see what was going on on the
                                                              5
                                                                  can't do it everywhere, and we can't do it through all
6
    31st or so. But just to give you an idea -- and,
                                                              6
                                                                  time.
                                                              7
7
    again, some of you have seen this, the plume coming
                                                                                    So what we want to do is we want to
8
   out on the ebb, casting waters that come down.
                                                                  answer the question of what's the spatial distribution
                                                              8
9
    Sometimes when there is a larger discharge, you will
                                                              9
                                                                  of stress throughout this entire study area. So how
10
    see the discharge right into the, down into The Race
                                                             10
                                                                  do we do that? We are going to run this model, and
11
    and into Plum Gut.
                                                             11
                                                                  we're going to be able to then answer the questions
12
                      But you will generally always see a
                                                             12
                                                                  about where the regions are where the stresses are the
13 nice frontal zone in the vicinity of the Connecticut
                                                             13
                                                                  largest and the stresses are the smallest, and then
    River. You may not see as much as in the case of the
                                                             14
                                                                  the other question that we will be able to answer at
   Thames. But if we ran this a little bit longer, we
15
                                                             15
                                                                  some point is where does the material in the water go.
16
    get a good rainfall after Sandy. You will see this
                                                                  If it does get eroded, where will it go?
                                                             16
17
    guy coming out and getting very close over to Fishers.
                                                             17
                                                                                    And to do this we're using a model
18
                      So we're dealing with a spatially
                                                             18
                                                                  called FV-COM, which is the Finite Volume Community
19
    and temporally variant system, and the problem -- the
                                                             19
                                                                  Ocean Model. It's been developed by UMass up in New
20
    question, the project goal is to assess what that
                                                             20
                                                                  Bedford and we're nesting it -- this is our model
                                                             21
21
    means in terms of circulation and boundary shear
                                                                  domain here extending out onto the shelf. At the
22
    stress, okay? Let's go back to the slide.
                                                             22
                                                                  shelf boundary here we are driving it using this
23
                                                                  larger model, which covers the entire northwest
                      Well, you saw it. Again, this is
                                                             23
    just sort of a summary slide. We're really ahead of
                                                             24
                                                                  Atlantic.
   ourselves here. We are showing you some model results
                                                             25
                                                                                    Our model is forced by tides along
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River at that day.

Page 27 in the blue, but the red or green observations are a couple places in the study area, and you have to look 3 at this carefully to realize there's a difference in scale here, but you are seeing waves down in this area 5 that might have a significant wave height of about one and a half meters, 1.4 meters. 6 7 We get further in, Six Mile Reef 8 down in here, you will see waves that very seldom get over about one meter or so. This down in here is just 9 10 about a meter. So there is some spatial variation as 11 you would suspect, okay? An area a little more 12 sheltered, an area a little more prone to the wind 13 effect, because the water depth and the like there and 14 some other spatial variations. We will see more of 15 this when we get into the results of the model, okay? 16 So just the background of the 17 physical oceanography of Eastern Long Island Sound, 18 which I hope just reinforces what you already know. 19 Next one (slide). So Grant will tell us a little bit

22 use the model for, as Frank was just telling us, is to

23 be able to sort of fill in all the gaps for what we

24 cannot measure both in space and in time. We can go

out there. We can put something on the bottom. We

DR. MCCARDELL: So what we want to

13 Trumbull here for today is probably that it's 35 degrees and overcast, and temperature, yeah, we're 14 pretty close to climatology today. In terms of 15 16 precipitation we're probably not very close to 17 climatology. 18 Think of climatology as sort of like 19 the Farmer's Almanac of what are the typical 20 conditions for a typical location for a particular 21 week or month, and so that's what we use for the 22 surface heat exchange. So we're not modeling 23 individual years for the surface heat exchange, and 24 we're also not modeling individual years for how we start this up, but we do run it for long enough that

this outer boundary. The water goes up and down,

which forces the water in and out in an appropriate

manner. We're forcing it with observed river flow, these green arrows, and we're getting that from USGS

gauge data. So for any given day we're replicating

cooling for the heat, we're using climatology, and by

the word "climatology" here what I'm talking about is

location." In other words, the climatology for Fort

"what are typical conditions at a given date and

In terms of the warming and the

what was the actual river flow in the Connecticut

about the model.

20

21

Page 29

Page 30 Page 32 we then are able to model individual years. Next finite volume fluid elements, and we're solving these 1 2 slide. equations at a real world time of every 6 seconds 3 So how does this whole thing work? across this domain. 3 Well, this works on an unstructured grid. It's finite 4 4 So needless to say 10 or 20 years 5 volume. I'll show you what that means in a minute. 5 ago we couldn't do this. You need state-of-the-art 6 It's a primitive equations model. What that means is 6 computing equipment to be able to run this sort of 7 it works according to first principles. It works 7 model. Now our study area here is this red box. Next 8 according to Newton's laws by F equals MA. So it 8 slide. 9 starts from the very, very basics, and it solves the 9 And you can see the little triangles 10 equations that were derived from Newton's laws by 10 here, and so here is The Race. There is the 11 Navier and Stokes in the early Nineteenth Century, and 11 Connecticut River, Niantic, I'm sorry, Niantic Bay, 12 they derived these equations, but they were unable to 12 the Thames, Connecticut River over here, and these 13 solve them. 13 little triangles are what the model is running on. So 14 But fortunately we can approximate 14 the resolution of our model is those little triangles. numerical solutions to these equations with computers. 15 15 And it's important to note that this 16 And so what we get from the model is we get the water 16 is the resolution of our grid; it's about 100 to 500 17 velocity; get the sea surface height; get temperature 17 meters, which is about a quarter of a mile so we're and salinity, and then the model iterates itself. It 18 18 resolving down to a quarter mile. So we're resolving 19 says "okay, here I am. What's going to happen next?" 19 the individual dump sites, but we're not resolving 20 and the model runs on a time step of 6 seconds. 20 whether or not we cut off a little corner of one of 21 So every 6 seconds of real world 21 the dump sites or whether we move the border of one of the dump sites by 100 feet. Next slide. 22 time we do this calculation, and then what we're 22 interested in getting out of the model for this study 23 So how well does this model do this? is the stress. That's tau, the Greek letter tau we 24 Well, this is sea level that's coming from the model 25 use to represent the stress, and that's the product of 25 (being forced at the boundary like I said) compared to Page 31 Page 33 1 the water density times rho. (That's the thing that data at the Bridgeport gauge, and it's doing pretty 2 looks like a P) there times this C sub D, which is the well. The model is in blue. The data is in black, 3 drag coefficient -- Frank will talk to you a little 3 and it also does very well for temperature and 4 bit about that afterwards -- times the square of the salinity as well, and this is throughout the entire 4 5 water velocity. U is the east-west velocity. V is 5 domain. the north-south velocity. 6 And we determine something called a 6 7 You can think of it (pointing to 7 Skill is, and what the Skill is, is what's the error 8 u-squared plus v-squared) as just the square of the 8 in the model from 100 percent. So if the model was magnitude of the velocity, and it's important to 9 9 perfect, it would have a Skill of 100 percent. A 10 realize that it's the square of the velocity. What 10 Skill of 90 percent means that the model is staying 11 that means is that a small change in the water 11 within about 90 percent of the data. In other words, 12 velocity will equal a bigger change in stress. If I 12 there is about a 10 percent error in the model. 13 That's about a 10 percent error in velocity as well. 13 double the water velocity, I will quadruple the 14 stress, and this is the way the model calculates 14 So if I square that 90 percent stress, and this is also the way, as you will see, 15 Skill, because the velocity is square, I come up with 16 that we have determined to be one of the more robust a Skill for the stress of about 80 percent. So, in 17 methods to calculate stress out in the field as well. 17 other words, these stress values you probably can take 18 Next slide. 18 as being plus or minus 20 percent, and spatially it's 19 So here is our entire model domain 19 probably even better than that. 20 again, and like I say it runs on these little 20 So our model is working very well in triangles. So for every single one of these little 21 21 the world of physical oceanography and ocean models --22 triangles we're solving the full equations of motion, 22 and atmospheric models, for that matter. I should add and our model domain right now has about 30,000 23 that atmospheric models work on this exact same set of 23 triangles, and it does this at 15 different depths. 24 equations. They model fluid flow whether it be air or

So we're modeling about a half a million discrete

water. And in terms of model skills our model is

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Page 34
1 doing very, very well. These are very, very good
                                                                 And then winter was November through January where we
2 numbers. Next. And how good is the stress and what's
                                                                 had low river flow and a fairly energetic wind field,
   the stress? Well, that's why we had the field
                                                             3
                                                                 okay?
4
    program.
                                                             4
5
                      DR. BOHLEN: So we're going to go
                                                             5
6
    out and gather up some data to verify all of that and,
                                                             6
7
    again, within the zone of site feasibility, and we
                                                             7
8
   selected seven sites, and it says deployed instruments
                                                             8
9
    on 7 bottom tripods on two, sorry, three two-month
                                                             9
10
   observation campaigns, you will see the three
                                                            10
11
    campaigns, to observe spring, fall and winter
                                                            11
   conditions at locations having different stresses.
12
                                                            12
13
                      How did you pick out these seven
                                                            13
14 sites? They're not coincident with any of those boxes
                                                            14
15
   you saw before. They're close on some cases, but that
                                                            15
16
    wasn't the issue. We have run stress models before in
                                                            16
17
    this area, and we were looking to get data at a
                                                            17
   variety of locations that would give us a variety of
                                                            18
19
    conditions.
                                                            19
20
                      So don't put all your instruments
                                                            20
21 within a quarter mile of each other. Pick out a
                                                            21
22 number of locations that are going to give you a range
                                                            22
   of answers. So what you have the seven sites here
                                                            23
24 going from roughly Six Mile or so down in here out
                                                            24
25 close to Block.
                                                            25
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So we put out these arrays. This is
a triangular array (referring to slide). We can get
an idea of what it looks like here, stands about 6
feet or so tall, okay, and it has a variety of
instruments, and I can spend all afternoon talking
about the instruments to you. So if there are
questions, we can do this later.
                  But to begin with you had an
acoustic Doppler current profiler. You are going to
hear a lot about ADCPs if you start playing with
oceanography these days. That's how we measure
currents these days. In the old days you put out a
current meter at a discrete point, maybe a number of
them over the vertical. So you had this array of
instruments sitting over the vertical.
                  Now we have a single instrument at
the bottom that can project an acoustic beam through
the water column. And if we segment up the
reflection, if you will, of that acoustic beam back to
the sensor package, I can tell you what the currents
look like at layers through the water column. In this
case this is an RDI acoustic Doppler current profiler,
                                                Page 37
and it's looking up, and it's giving us one meter
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Page 36

Page 35 1 We conducted three campaigns -- you 2 will see it in a minute -- three campaigns, and during 3 each of those campaigns there was also a survey, shipboard surveys. We went out to service the array 5 so we did measurements along the transects. So there is a variety of data gathered up during these campaigns, six cruises with water column measurements 8 at the seven tripod locations plus four additional 9 stations in between, okay? Next. 10 Here are the campaign periods we 11 had, spring, summer and winter. Conditions you are 12 familiar with, the seasonality. You saw at least in 13 stream flow, that there was a clear seasonality. You 14 saw, I hope, in the temperature and salinity that there was something of seasonality, and you can 16 probably believe that if we looked at the wind field, 17 there is something of seasonality in the wind field. 18 We generally believe that the 19 highest winds are during the transition periods in the 20 spring and in the winter, sorry, spring and in the 21 fall, okay? And so we have a spring campaign that's 22 March to May, 66-day -- all around 60-day campaigns. 23 When we had high river flow, you saw that April 24 typically, generally high winds. Summer, low everything. Sailors know that all too well, right?

slices through the water column to the surface through the bottom, okay? We have another instrument sitting on here. This is a Nortek acoustic Doppler current profiler, same ADCP but very different instrument. This is what they call a pulse coherent instrument, which allows you to make very fine measurements. This thing is mounted about three-quarters of a meter above the bed, and it's measuring currents every centimeter down to the bed. So we're really slicing up that portion of the boundary layer that's coming down right onto the bed that I told you was important in terms of boundary shear stress. Now, that current is very, very -as it gets down at the bottom is very important. We're measuring it. We can measure it. We can take a look at it. We can also see that Grant, in his model, the values for the velocity in that profile. There is also a temperature salinity

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Page 38 Page 40 points over the vertical. The rest of it has to do manufacturer. 1 with the recovery. 2 This was an instrument that was sent 3 back to the manufacturer for refurbishment before So we get water column currents and 3 4 waves from the ADCP, RDI. We get currents and stress 4 being put out, and they put the wrong firmware in it. 5 at the bottom. That's the Nortek. We get suspended 5 It came back brand new, well paid for, no work, okay? 6 material concentrations. We get temperature and 6 You will also notice this 6A/B here. That we get out 7 salinity. We put this thing out for 66 days. It 7 here campaign one, the Nortek, 25 of the 66 days, here 8 samples once every 15 minutes and it bursts samples. 8 28 of the 66 days. 9 That means that it runs for a period of time every 15 9 There were two things going on here, 10 minutes. Sample rates are typically on the order of 10 the main one being that the frame got tipped over. It 11 one sample a second, maybe two to four samples a 11 got tipped over one and a half times, and then we were 12 second, depending on the instrument, for minutes, 12 smart enough to move it after that. We generally try 13 every 15 minutes. You can imagine you are bringing 13 to pass the word out among the fishermen so that they 14 back a fair block of data. 14 know where the gear is, and it's been a very 15 successful approach over the years, but somehow this The shipboard surveys made use of 15 16 this guy. This is a profiling conductivity guy managed to get bumped. 16 17 temperature depth sensor right here, CTD. It also has 17 The other thing it was that in the first campaign you see this all 25 of 66. This was a 18 a series of bottles on it. So as I send this down to 18 19 measure temperature salinity over the vertical, I can 19 learning curve on the batteries and what the batteries draw water samples. You can bring the water samples 20 could do, and we expected them to last for the 60 20 days. They didn't last for the 30 days. That's why 21 back and use them to calibrate the other instruments. 21 22 I actually have a sample of water 22 you got 25 days of recovery. now with some amount of suspended material in it. I 23 But overall if you look through can filter it down, and I can see what the OBS is 24 this, the data return is very, very good and certainly telling me and where it's right or wrong. The optical 25 provides us with more than enough data remembering how Page 39 Page 41 back scattering probes, okay? we're bursting and frequency that we're sampling 2 At each of the stations where we 2 during the burst to calibrate the model. Let's take a 3 stop to use the CTD we got water samples, but we also 3 look at some of the results. This is the RDI ADCP got sediment samples, grabs, bring them back and take 4 mean velocity. You are going back, You are going 5 a look at what the sediments are at those stations. 5 forth, you are going back, You are going forth, you There are much, much more extensive sediment maps out are going back, You are going forth, and every little 6 7 there. These are supplementary measurements to the 7 bit you get a little bit further along. sediment maps. 8 8 There is a mean in the velocity 9 9 field. It ain't just sloshing back and forth. Some The U.S. Geological Survey has done 10 an extensive high-resolution survey of sediments in 10 of that temperature salinity effects, some of the wind 11 this area. We know the sediments in Eastern Long 11 effects give us a net, and that shows up in the means, 12 Island Sound very well, okay? (next slide) This is 12 okay? So the stuff will go up as you saw in the movie 13 the data recovery for temperature and salinity. That 13 the way the plume was moving back and forth. 14 was that CTD probe that was on the frame, currents and 14 If you take a look at it, in my case suspended sediments, that's Nortek and the OBS, and 15 when I'm not tied to the river, I might be moving one 16 this is waves. That's the RDI. And we start off with 16 way or the other. In this case what the data are

when I'm not tied to the river, I might be moving one way or the other. In this case what the data are showing you is that if you set it at this point, the net transport would be to the northwest. Here it is slightly more west of north, and here it is more like southwest, southwest, southwest, well, west, call it northwest, got it, with the three different colors being the three different campaigns.

23 The net drift near bottom, what this

24 is saying the net drift near bottom water column, we 25 are 3 meters off the sea floor, is into The Sound. A

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through this.

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different campaigns. These are coming down running

depending on what you happen to look at, and in some

times this guy gave us 66 days, and we were out there

for 66 days so it worked all the time, but this guy

recovery was something in excess of 50 percent

22 areas, sometimes it was 100 percent. But in some

gave us nothing. That was courtesy of the

To make a long story short the data

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Page 42
                                                                                                                  Page 44
                                                                  tidal ellipse. The major axis of the tidal ellipse
    typical estuarine pattern you expect bottom waters in
    the estuary to be moving in. Fresh water on top is a
                                                                  going off here to the southwest, more to the west of
                                                              2
                                                                  southwest, okay? Here a little bit more northwest,
3 little bit lighter, a little bit less dense. Sitting
                                                              3
    on top, it runs out. So if it's running out, it's got
                                                                  northwest, and the magnitudes running in here on the
                                                              4
    to be running back in to keep the water in The Sound.
                                                              5
                                                                  order of half a meter per -- 50 centimeters a second,
6
    Typical transport.
                                                              6
                                                                  a knot.
7
                                                              7
                       If you get down closer to the bed,
                                                                                    So you got that guy there, I don't
8
    this is a Nortek matter, (pointing to another slide)
                                                                  know, call it from here out, maybe a knot and a half
                                                              8
9
    looking at that three-quarters of a meter to the bed,
                                                              9
                                                                  in that neck of the woods as the major axis, okay?
10
    same sort of thing roughly. You know, if you take a
                                                             10
                                                                  So, again, you pretty well have that in mind, and you
11
    look in a little more detail, there are now going to
                                                             11
                                                                  saw it pretty well in the movie going back and forth,
12 be six arrows, because we went out and recovered data
                                                             12
                                                                  this magnitude, and this shows you there really wasn't
13
    twice during each campaign -- these on the bottom,
                                                             13
                                                                  much difference for all of the seasonality that we
14
    okay? Basically the same sort of a pattern.
                                                             14
                                                                  were looking for in terms of the behavior of the
15
                      The main thing, the message to take
                                                             15
                                                                  system from campaign 1, 2 and 3, not all that much
16
   home here it is a typical estuarine flow coming in at
                                                                  difference in terms of the tidal ellipse. Okay.
                                                             16
17
    the bottom, and a magnitude, how about that one?
                                                             17
                                                                                    Real quick what this is showing we
18
    These little arrows are worth 10 centimeters a second
                                                             18
                                                                  were looking here at the wave conditions, significant
19
    if they're about that long. Capish? 10 centimeters a
                                                             19
                                                                  wave height at the station off Montauk, okay? Block
20
    second? Nah. Come on. You don't have to lie to me.
                                                             20
                                                                  Island, Montauk sitting here, this guy in here, and
21
    10 centimeters a second, fast or slow?
                                                                  we're looking to see what the effect of the waves are
                                                             21
22
                      MR. JOHNSON: Fast.
                                                             22
                                                                  on the bottom shear stress, and to make a long story
23
                      DR. BOHLEN: I got a fast. One
                                                                  short what these data are showing, despite the fact
                                                             23
   knot, one nautical mile per hour 6,080 feet per hour,
                                                             24
                                                                  there is a significant difference here in wave
25
   okay? 50 centimeters a second, 5-0, one knot. You
                                                             25
                                                                  characteristics, there isn't that much difference in
                                                     Page 43
                                                                                                                  Page 45
   can call me a liar if you want to (inaudible). One
                                                                  bottom stress, okay, as you come along in this.
2 knot, 50 centimeters a second, so 10 centimeters a
                                                              2
                                                                                    It's an interesting curve in the
3
   second is not all that fast, but it's persistent.
                                                              3
                                                                  tracking. We can get into this later whether its
                                                                  tracking logarithmically over the vertical or not.
4
    It's persistent, okay?
                                                              4
5
                      Again, back to that, we get a feel
                                                              5
                                                                  Next slide. Now that makes sense. One thing I didn't
   for this thing, you know, what's sticking, what's not
                                                                  tell you, when I showed you that slide of the zone of
6
                                                              6
7
    sticking, what's fast, what's slow. It's important.
                                                              7
                                                                  siting feasibility, there was around the perimeter a
8
   Okay. So you are looking at net drifts that run on
                                                              8
                                                                  gray area. That's an exclusion area. That's thought
    the order of 10 centimeters a second, 5 to 10
                                                              9
                                                                  to be more or less coincident with the areas that are
9
10
    centimeters a second, and you can figure out what that
                                                             10
                                                                  going to be influenced by waves. So its variously
11
    means in terms of net transport over the course of a
                                                             11
                                                                  estimated at being something like 17 meters.
12
    day.
                                                             12
                                                                                    DR. HAY: 18 meters.
13
                                                             13
                      This is probably not entirely
                                                                                    DR. BOHLEN: How many.
14
   necessary, (next slide) but this is the tidal ellipse
                                                             14
                                                                                    DR. HAY: 18 meters.
    over the vertical. This is the average over the whole
15
                                                             15
                                                                          A. 18 meters, he says. We were arguing
16
   of the vertical, and it just shows you that if we were
                                                             16
                                                                  yesterday about 17 or 18, 18 meters. So it ends up
17
    tracking the tide the way this thing goes and it's on
                                                             17
                                                                  around 60 feet or so, alright? So it's not terribly
                                                                  surprising when all of our instruments are outside of
18
   the flood, it would be going that way, and then we
                                                             18
19
    wait six hours or so, and little by little the tide
                                                             19
                                                                  that that the response to the system, to the waves, is
20
    starts to drop off in speed, but it changes direction.
                                                             20
                                                                  not all that great, okay?
21
   With me?
                                                             21
                                                                                    This just shows another area -- to
22
                      Little by little over the course of
                                                             22
                                                                  show you that we've got a real spring neap cycle in
23 a half an hour or so it's dropping in speed and
                                                             23
                                                                  the boundary shear out here, okay, that we don't see a
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24

24 changing in direction before it goes back onto flood.

That's what you are looking at here, the so called

lot of kick up in the shear as we change the waves,

and we're getting up to 2 meter waves here,

Page 46 Page 48 significant wave height. That's a significant wave that coefficient against a different way of 2 height. The average of the one-third highest waves, calculating the stress, okay? Alright. So here we 3 that's not the maximum wave, so you can get almost go. The rubber hitting the road. The model 3 twice as much. The maximum heights are almost twice simulation says here we reproduce tidal and spring 4 5 as much as that. 5 neap variations on the observed stress. Now, you saw 6 So, again, you pick up the spring 6 some of the spring neap variation -- spring neap, do neap cycle pretty well in this, but it doesn't show up 7 7 you understand that? Twice monthly variation in the 8 very much in terms of wave response, okay? (next 8 tide, right? 9 slide) This is a comparison between two methods to 9 We're just off the full moon. We're 10 calculate the boundary shear stress, and the one you 10 in the spring portion of the monthly tide. It has 11 saw was the so called bulk formulation. That we take 11 nothing to do with April, May, March, whatever it is, 12 the drag coefficient times the square of the 12 okay? This is twice a month. You got a new moon, and 13 velocities. That's the bulk formulation. 13 you got a full moon, and you have maximum tide during 14 There is another way to do it, and 14 the new moon, maximum tidal range during the full moon, and in between smaller range -- neap, okay? 15 you argue whether it's better or not so good, and 15 16 that's the log in here. And if there was a perfect 16 So you are looking at the spring 17 fit between the two, it would be on this one-to-one 17 neap cycles here coming along this guy, and then you line down here. Well, you see that we're coming along 18 are looking at a comparison, and I realize it's a 19 calculating the stress levels using the two 19 little difficult to see here between the field 20 techniques, and they're pretty close, you might slide 20 observations the calculated values and the model 21 that over a little bit, until we get up to a stress 21 values. And to make a long story short on this one we 22 level of about one Pascal, and at one Pascal it starts 22 argue, using these sorts of data, that the model is 23 to dive off. 23 doing a pretty good job of reproducing the measured 24 We could sit here and argue with you 24 results, which is what, of course, we were trying to about why it's diving off. It would take another half 25 verify. And next time we will have a different color Page 47 Page 49 an hour to explain the differences in the change of for you. The blues and reds and pinks and purples are the flow field, what happens when you get up here, why 2 hard to see. Okay, next. 3 the velocity profile may not be logarithmic at that 3 This is very good here. This is another comparison between the two. This is your bulk level. But suffice it to say what we're using this 4 little calculation for is to demonstrate at least to 5 formulation again, that equation, okay, and these are us the adequacy of the drag coefficient of 0.0025, the field observations. 6 7 which was the selected drag coefficient that was used DR. MCCARDELL: No. 8 in the formulation you saw earlier. 8 DR. BOHLEN: I'm sorry. The other 9 way around. These are the field observations and So the data do a pretty good job of 9 10 verifying that selection until you get up to a point 10 that's the model. We have it upsidedown and that's 11 where nobody is surprised that it doesn't work, to put 11 the model, and this is the mean of the boundary 12 it in plain language, okay? So this is a very 12 shears, okay? And then if they were identical, they valuable set of data. If you take a look at this, you 13 would lay on the one-to-one lineup here, and what you 13 14 don't often get a chance to really get down into the 14 are looking at this is now mean values over the nuts and bolts of the flow field. 15 period. 16 MR. ALLYN: So the coefficient gives 16 Correlation coefficient of about 17 the best fit between the two models. Is that how you 0.91, which is very high. When you start looking at 17 18 have the coefficient? the maximum predictions, this gets a little more 18 19 DR. BOHLEN: The coefficient was a 19 scattered in there, but it's still pretty close to the selected value. Well, there is a lot of data to say 20 20 one-to-one. In this case it gets down to a 0.7 -- 7021 it ought to be that value, and then the question is 21 percent. So you put that together with Grant was 22 does it make any sense. 22 saying about the accuracy of the model, the accuracy 23 23 of the comparison of the two, and it's looking like MR. ALLYN: Yeah. 24 we've got a pretty good handle on the boundary shear DR. BOHLEN: And now you are 24

stress in the model, okay?

comparing the results of a bulk formulation that uses

Page 50 1 then we picked our storm conditions, okay? Next. What's it all mean? So we want to 1 2 find the maximum bottom -- so we're now using the 2 Here are some of the numbers. We model, because the model gives us information on all broke it down by Eastern Long Island Sound and Block 3 3 Island Sound, and you see the Cornfield Shoals site 4 those little triangles, every quarter mile a little 4 5 square, okay, over the whole of the field. Compare 5 generally has the highest stress. Probably not 6 the value of the sites identified in the screening 6 terribly surprising. For those of you who have played process and simulate a period of a severe storm. We 7 down there you know it's mostly sands, and that from a 8 picked Sandy. Go ahead. 8 management standpoint over the years we counted it as 9 The bathymetry. You know it, right? 9 a dispersal site, and there is good reason for it when 10 Fairly deep in The Race, not so deep near shore. You 10 you take a look at the stress values. got the net depth coming back up. Six Mile on the end 11 11 Look at the range as you go through 12 (west). I don't think you need to see anymore. These 12 Six Mile, Clinton, Orient Point, back to Orient Point, 13 guys know this by heart, okay? So here you are in 13 Niantic Bay, and here is New London, okay? All values 14 terms of stress distribution. This is Pascals. Red 14 below 0.75. Get out, Fishers Island, east-west and center. This is south of Fishers Island around what I 15 is high, on the order of 3 or maybe down in here, 15 16 okay? Montauk not terribly surprising. Some places call the deep hole, okay? So there are values in 16 17 in the vicinity of The Race, some reds, fair amount of 17 there. Fishers Island center it looks pretty low, 18 yellow, and some amount of blue, low. 18 okay? Might even get east looking low relative to 19 As far as the zone of siting 19 what we see in The Sound. Block Island yet lower. 20 feasibility goes, remember where that is going, come 20 North of Montauk, low. North of Montauk is really 21 back over to see Block Island, okay? You got your Montauk Harbor, really in there. It's in the shelter. 21 22 Point Judith sitting over in here. It says that there 22 Okay, next. is a fairly high stress level particularly in the 23 So we took a look at Sandy, see what Eastern Sound through much of the zone of siting 24 we could do with it. Sandy was a fairly interesting 25 feasibility, okay? You are up in here. 25 event, right? Blew a little bit. These are our

Page 51 1 Remember we were cutting things off 2 looking at values something like 0.75 as being 3 something of a critical value for some of the 4 sediments we might be playing with in terms of dredged 5 material. The -- one of the things that's interesting here is that as we run this through the different campaigns, that the spatial differences we see 8 between -- here's an area, you know, Long Sand Shoal at the mouth of the Connecticut River and Block Island 9 10 Sound, you look at the spread, it's quite a spread in 11 stress values. That spread is much larger than you 12 will see seasonally, much larger than you will see 13 seasonally. 14 So that says that, to me that the tidal field is important, and that the differences 15 16 we're seeing are down in the subtle -- you will see

17 some of the subtle things in a minute -- but subtle as 18 in changing mean flow characteristics. That little 10 19 centimeters a second interacting with the mean flow of 20 a knot or knot and a half, may be substantial -- may 21 have a substantial effect. 22 So snapshot picture of the whole

23 thing. This is maximum bottom stresses during campaign 3. We picked campaign 3, because that's the supposed to be the highest energy winds in winter, and

Page 53 MYSOUND buoys out there, Ledge, Central Long Island

2 Sound, Western Long Island Sound, Execution Rocks, and

3 not surprising the Ledge shows the highest, about 60

knots or so, okay? Very short period. 4

5 So it was a wind event, short lived.

We know that. What you don't know, what this thing 6

7 doesn't show you one of the unique things about Sandy

8 of course is that it may not have blown all that much

9 max, but it blew a lot for a long time, and that is

10 significant duration, unusually long duration, and a

lot of that was from the southeast, which made for

12 interesting conditions through a number of our areas,

right? 13

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And if you take a look at the fetch, the over-water distance in which the wind can act, for Eastern Long Island Sound southeast is favorite. East nearly, northeast not so much; but certainly southeast has the potential for influencing what's going on down here.

20 So it was good from that standpoint, 21 fairly reasonable winds and significant duration, and 22 a storm surge which increased water depths through the 23 whole system, right? This guy is Kings Point 24 (pointing to a slide). This guy is New London. So

25 there is New London. You had a surge of something

Page 52

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Page 54
1 under 2 meters, about 1.5 meters - 5 to 6 feet, a
                                                              1
                                                                  compared this set of numbers with the earlier set of
                                                                 numbers, you'd see just what I told you. You still
2 surge down here, which has a recurrence interval of
                                                                 got Cornfield Shoals as the winner, New London as the
   every 10 to 30 years. You know, we will see it again,
3
                                                              3
4
    that kind of a thing.
                                                              4
                                                                  lowest end on the Eastern Long Island Sound sites.
5
                      You get down the western Sound, oh
                                                              5
                                                                  And if you run down this guy here, about the same.
6
    my goodness, look at the western Sound. Four meters
                                                              6
                                                                 Now you are getting down Fishers Island center,
7
    down at Kings Point, and, you know, in New York Harbor
                                                                  Fishers Island east, it's still below your 0.75. This
                                                              7
8
   it was even more. Occurrence intervals down there are
                                                                 guy went up quite a bit, the west, as you might
                                                              8
9
    hundreds of years. We won't get into an argument
                                                              9
                                                                  expect. The same thing for the Block Island Sound
10
    about how many hundreds of years. In fact, we
                                                             10
                                                                  site. It went up. Next?
11
    discussed that, but it's very, very low probability.
                                                             11
                                                                                    So it's defined as a level of stress
12
                      What should you care? Because you
                                                             12
                                                                 that's got to be mobilized, and I figured that we were
13
   stuffed a lot of water down my Sound, okay? You piled
                                                             13
                                                                 using a cutoff for the sake of screening of about 0.75
    up a lot of water down the western end of The Sound
                                                             14
                                                                  Pascals. That's going to vary depending on the stuff
15
    and that water's got to get out. That water coming
                                                             15
                                                                  you are playing with. The more cohesive it's going to
16
    back then has the potential to influence the velocity
                                                                  take more stress. The sandier, if you bring me out a
                                                             16
17
    field in the eastern Sound, and from that standpoint
                                                             17
                                                                  beach sand, it's going to take less, okay, and a
18
    that much water heading back out this way makes Sandy
                                                             18
                                                                  variety of other factors, too.
19
    an unusual event, and we're very fortunate to be able
                                                             19
                                                                                    If you just get me in talking about
20
    to take a look at some of the numbers on it, okay?
                                                             20
                                                                  the biological effects. Okay. Those damn bios messed
21
                                                                  up the texture of my sediment. They burrowed into the
                      It may be that there is a lot of
                                                             21
22
   subtle influences. It may be that it was the wind
                                                             22
                                                                  sediment, and so the physical oceanographer has to be
   field does more to that data. We will see. We will
                                                                  sensitive to the biology, but that's affecting the
                                                             23
    take a look at it. But people talk about the
                                                             24
                                                                  uppermost layer of the sediment column, and it has
25 frequency of occurrence of Sandy down here just in
                                                             25
                                                                 been shown over the years to be a relatively minor
                                                    Page 55
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terms of wind and maybe storm surge. That's one way 2 to think about it. But we're out in The Sound now, and what we care about is the amount of water that was produced in this and where it went and what it is 5 going to do to us if it starts going back out. Okay. So to make a long story short, if I 7 showed you that earlier slide with the yellows and 8 blues on stress, and I showed you this guy here now, this is Sandy's effect. About the only difference you 9 10 are going to see it says created higher maximum bottom 11 stresses in some areas. Well, now it turns out if you 12 looked at the absolute numbers on the table -- I'll 13 show it to you in a minute. I don't expect you to 14 memorize the last table. 15 I'm telling you what we're looking at is, for the most part, each one changed a little 17 bit. Some fair number of them went up a little bit. 18 But in terms of the deeper water effects they weren't 19 as great as you might expect. Most of the effects 20 we're looking at higher stress in the shallow areas 21 near shore, which given the wind field, you know, you 22 don't need a model to tell you that probably. Okay, 23 next.. 24 So here we are. About the same distribution of stress. And if you went down and

Page 57 effect. They build themselves little cocoons to stay put, okay? Next. If you do that -- why don't we --This is the comparison. Basically what you are looking at here we just split up what you just saw into areas that were greater than one Pascal, 0.75 to 1 Pascal and less than 1 Pascal, and you got Block Island Sound, New London, Fishers, Orient Point, Fishers Island east and north of Montauk as the sites that are below 0.75. The remainder were above 0.75. Okay. MR. JOHNSON: Are you going to talk about capacity in any of these sites? DR. BOHLEN: No capacity. Just -with the exception of depth that is included in the model, what's out there is what's out there. COURT REPORTER: Sir, can I have your name, please? MR. JOHNSON: John Johnson. COURT REPORTER: Thank you. DR. BOHLEN: So before I gave you different shadings from the reds to the blues, right, browns to the blues. Here we just -- everything that's above 0.75 is in brown, and you can see this is

maximum bottom stress exceeding during the simulation

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Page 58 Page 60 in the Eastern Sound, it may be somewhat coarser on 1 of Storm Sandy, okay? What are you looking at is 2 Sandy. And as I said, if we did this for the the bottom on average. So a simple correlation might non-Sandy, you're not going to see all that much of a be there except for the fact that I can also bring you 3 change. You are going see some change but not all 4 to a number of locations in the Eastern Sound right in 5 that much of a change. The Race where you have very fine grained deposits 6 What impresses you here is that 6 that are quite stable. And when you go down and you there is a lot of brown. That's fine. What does it 7 put your flippers into it, you are amazed that because 7 8 all mean to us? This quy. It says sites 1, 2 and 7, you are dragging along trying to stay there that this 8 9 Cornfield Shoals, Six Mile and Fishers Island. 9 stuff stays put. 10 Fishers Island - West, that's south of the island, 10 The sediments there are classes of 11 have high maximum stresses. You saw that. Orient 11 fine grained sediments, and the majority shows this 12 Point, that's Orient Point, Block Island Sound show 12 behavior when stress can really build up resistance to 13 maximum stress levels below at the center of the site movement. So the simple correlation is very often 13 14 but have values in excess of 0.75 within the boundary. 14 hard to realize. You will find high energy flows and 15 So there is some variation maybe the 15 fine grained deposits out there. Is that what you are 16 way the triangles were placed. We can argue about it. looking for? 16 17 Niantic Bay and Clinton Harbor show maximum stresses 17 MR. CAREY: Yeah, and so a little 18 exceeding 0.75 but less than one. We can sit and tune 18 follow-up is that presumably based on characterization 19 this later, but that's what the model is showing you 19 of dredged material you chose fine sand as kind of the 20 right now the way it's laid out. New London disposal 20 driver that gave us this 0.75 Pascal. 21 site is the only site in the Eastern Sound with a 21 DR. BOHLEN: Right. 22 maximum bottom stress below 0.75. That's what we did, 22 MR. CAREY: If you shift down to say 23 that's how we did it, and that's what we found. 23 very fine sand or a slightly more complicated mix of 24 Questions? 24 grain sizes, you could get those materials to the 25 DR. HAY: So we have 35 minutes or 25 bottom, get them to stay in place in slightly higher Page 59 Page 61 1 so for questions and comments. Please speak up, and shear than necessarily this. also please mention your name and any affiliation up 2 DR. BOHLEN: Absolutely. What we're 3 front. 3 looking at here, this is the conservative. 4 4 MR. CAREY: Drew Carey. Frank, the MR. CAREY: Right. DR. BOHLEN: I don't know how you 5 sediments on the bottom are obviously going to 5 integrate the shear stress over time, and you didn't 6 class the conservative anymore, but --7 see a lot of effect from the wave climate in general MR. CAREY: Go ahead. Call me a 8 because of the water depth. 8 conservative. 9 DR. BOHLEN: Yeah. 9 DR. BOHLEN: Now, what we have up 10 MR. CAREY: So really the tidal 10 here, 0.75, you can probably find that same material prism and the bathymetry is what's driving a lot of staying put in stresses in excess of one. I would say 11 12 the distribution of this shear stress, I would guess. 12 we really want to have that stuff -- we would be sure 13 13 that that stuff is going to stay. That's use 0.75. I Do you expect to see pretty reasonable correlation 14 between those model shear stresses and the kinds of don't know whether that's liberal or conservative. 14 15 sediments that will be seen on the sea floor in 15 DR. HAY: Any questions? Comments? 16 different locations? 16 MR. ALLYN: Compliments to you and 17 DR. BOHLEN: In a general sense, 17 your staff. That was amazing. 18 DR. HAY: Thank you. 18 yes. That is to say if I was to draw you that stress 19 diagram from Central Long Island Sound to Montauk, you 19 DR. BOHLEN: I want to emphasize two 20 would see that in general the stresses are lower in 20 things. This continues to be a work in progress, 21 the western part of that down toward Central Long 21 because the next step on this whole thing is to 22 Island Sound than in the east. 22 quantify the sediment transport. So we got a pretty 23 And if you look at the sediments in 23 good understanding of the velocity field and the shear 24 general, once you get across Mattituck Sill, you tend 24 that's associated with it. to find softer sediments that have accumulated. Out 25 Now we want to try for the sediment

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                                                                                                                 Page 64
                                                                 does -- what other additional information is going to
    transport model so we give you some ideas of the
2 probability of movement, and then again what he said,
                                                                 be inputted to those people who are going to, you
3 Grant said about where the stuff is going to go so
                                                                 know, designate some other sites?
                                                             3
    we're not finished yet. And then for those who
                                                             4
                                                                                   DR. BOHLEN: Jean.
   haven't asked the question, I asked the question about
                                                             5
                                                                                   MS. BROCHI: Again, I can take that
6
    when I heard about it.
                                                             6
                                                                 and I can answer the capacity question as well. So
7
                      The next step in this whole business
                                                             7
                                                                  the capacity of the potential disposal sites, the
8
   is so you have established some background for
                                                                 dredged material disposal sites, potential sites, not
                                                             8
9
    exposure. The swimmer is down there, and there is
                                                             9
                                                                 dumping sites, the capacity and dredging needs is part
10
   some mud that's looking at going by. What about the
                                                             10
                                                                 of the Environmental Impact Statement as well as
   effects, the biologicals, where the movement of the
11
                                                            11
                                                                 biological characterization, the physo (physical
12 mud and the movement of the mud where the constituents
                                                                 oceanography), sediment, economics.
                                                            12
13
   may be impacting the benthic community or the water
                                                            13
                                                                                   And all of that will be pulled
    column. So the biological study has also yet to be
                                                            14
                                                                 together in an environmental consequences. It will be
                                                            15
15
    done so it's very much a work in progress.
                                                                 evaluated along with no alternative, which means what
16
                      MS. MCKENZIE: Tracey McKenzie. I'm
                                                                 happens if we don't -- there are no sites that are
                                                            16
17
    curious as to what your schedule is for your next
                                                             17
                                                                  available.
18
    sediment transport modeling.
                                                            18
                                                                                   MR. JOHNSON: How far along are you
                      DR. BOHLEN: You want to answer
19
                                                            19
                                                                  in the studies of those other factors?
20
                                                            20
                                                                                   MS. BROCHI: This is one of the
    that.
21
                      DR. HAY: Well, the sediment
                                                                 major studies that we just completed. That's why
                                                            21
22
   transport modeling is -- there are two elements that
                                                            22
                                                                 we're having this public meeting. Biological
   are still being worked on. One is an LTFATE,
                                                                 resources we have some information. We have a
                                                             23
    long-term sediment transport model and a short-term
                                                             24
                                                                 literature search on, the dredging needs capacity. We
    sediment transport model. Maybe Grant, you want to
                                                             25
                                                                 have the Corps of Engineering finalizing that report
                                                    Page 63
                                                                                                                 Page 65
    elaborate on that quickly.
                                                                 right now, and it all will be compiled into the
2
                      DR. MCCARDELL: I have to refer you
                                                             2
                                                                 document, which will be the draft.
3 to Professor O'Donnell who is out of town as far as
                                                             3
                                                                                   MR. JOHNSON: And your deadline is
   that's concerned. We're working on both of those
                                                             4
                                                                 December of next year.
5
   projects.
                                                             5
                                                                                   MS. BROCHI: 2016 for the final.
6
                      DR. BOHLEN: The reason that I laugh
                                                             6
                                                                                   MR. JOHNSON: January 1, 2016?
    is soon is all we ever hear. So I can't tell you that
                                                             7
                                                                                   MS. BROCHI: December 2016 is the
8
   it's December 16 or whatever, but all of this I think
                                                             8
                                                                 final, rulemaking and --
    as you saw in the schedule is going to have to be
                                                             9
                                                                                   MR. JOHNSON: That's two years.
10
    quickly addressed to get things finished off by next
                                                            10
                                                                                   MS. BROCHI: Yes. We're coming out
11
    spring.
                                                            11
                                                                  in the spring with the draft so that's probably the
12
                      DR. HAY: In other words, there is
                                                            12
                                                                 date that you will hear from us, and we will have a
13
   still modeling that is taking place at this time.
                                                            13
                                                                 public meeting.
14
                      DR. BOHLEN: Right.
                                                            14
                                                                                   DR. HAY: Next up is -- next up is
                      MR. JOHNSON: John Johnson. Is
15
                                                            15
                                                                 Bill, actually, sorry.
16
   this --
                                                            16
                                                                                   MR. SPICER: Bill Spicer, Spicer's
17
                                                            17
                                                                 Marinas. Also a member of the Connecticut Marine
                      DR. HAY: Do you have an
                                                            18
                                                                 Trades and a member of the Stakeholders Commission who
18
   affiliation.
19
                      MR. JOHNSON: Yeah, I'm sorry, CMTA.
                                                            19
                                                                 is supposed to comment on the DMMP. I noticed a
20
   Is this the only input that's going to determine the
                                                             20
                                                                  couple, three things. All of us have been looking at
21 relocation sites and sediment dump sites? We take
                                                                  the NY DOS failure of consistency for some of our
                                                             21
22 offense in the Marine industry to calling them dump
                                                            22
                                                                 dredging permits. Mine has been out for eight years,
23 sites. I think they should be called property
                                                             23
                                                                  since 2006, and continuously renewed very faithfully
24 relocation sites.
                                                             24
                                                                 and is in force.
25
                      That all being said the question is
                                                             25
                                                                                   But it recently was declared, after
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    208 days, to be nonvalid. That it was not consistent
                                                                 here in New England except that when I -- I found out
2 with what New York had. It's very interesting the
                                                                 about it in the afternoon, and I went to DEP the next
                                                             2
3 site 6 tests out very, very nicely when you're putting
                                                                 morning to challenge it, because I was furious.
                                                             3
4 real scientific data out with real oceanographic
                                                             4
                                                                                   We have been opposing Ambro for 32
   studies and real oceanography running, and it shows
                                                             5
                                                                 of 36 municipalities to have water go up and down in
6
    that the NLDS is doing very well.
                                                             6
                                                                 Connecticut, tidal water, 32 of 36 opposed Ambro in
7
                      Now, I know we're in here, because
                                                             7
                                                                 print and wanted it repealed.
8
   we're supposed to be designating one or more sites in
                                                             8
                                                                                   MS. BROCHI: Okay. So I am going
9
    Long Island Sound, which is kind of interesting,
                                                             9
                                                                 to -- you bring up two good points I did want to
10
   because in some of the NY DOS claims where they are
                                                             10
                                                                 mention, actually. So Mike Keegan -- you sent
                                                                 something to Mike Keegan. He's working for the Corps
11
   claiming inconsistency, they have located NLDS as
                                                            11
12 northeast of the basin of Long Island Sound.
                                                             12
                                                                 of Engineers on -- he's joining us on this effort, but
13
                      Now, what that would mean The Race
                                                            13
                                                                  that's the Dredge Material Management Plan, which is a
14
   runs out in two deep valleys that kind of make a V.
                                                            14
                                                                  separate effort, which I didn't mention tonight, and I
                                                                  think most of you are familiar with that.
15
   The eastern one runs in through past Race Rock and
                                                            15
16
    between there and Fadden and comes out to about where
                                                            16
                                                                                   They will also be having public
17
    Bartlett's Reef is and swings west. The other one is
                                                            17
                                                                 meetings coming out with the programmatic EIS and
18
   further west over by Little Gull Island, between there
                                                            18
                                                                 documentation for that.
19
    and Fadden.
                                                            19
                                                                                   MR. SPICER: For the record I
20
                                                            20
                                                                 submitted that timely with a request for that. I
                      Now, I contended in a bound paper
                                                                 think it was in December of '06. It was undated on
21 that I submitted to Mike Keegan very early in this
                                                            21
22
   that the NLDS was in Fishers Island Sound. It's not
                                                             22
                                                                  the actual document. It was about that thick with
   down in the valleys and canyons. It's up on the top
                                                                 white covers and spiral bound.
                                                             23
   of the plateau, and it's not subject to Ambro. It's
                                                             24
                                                                                   MS. BROCHI: Okay.
25 subject to 404 waters and regular Army Corps of
                                                             25
                                                                                   MR. SPICER: I can provide more
                                                    Page 67
                                                                                                                 Page 69
   Engineers analyses the same way as is occurring in
                                                                 copies.
2
    every other estuary in the country.
                                                             2
                                                                                   MS. BROCHI: I mean, we can talk --
3
                      But we got singled out in 1980 by an
                                                             3
                                                                                   MR. SPICER: That's okay, continue,
4
   amendment slipped through Congress by Representative
                                                             4
                                                                 continue. You're doing fine.
5
   Ambro of New York aided by -- out of the guy's own
                                                             5
                                                                                   DR. BOHLEN: As far as our
   mouth, because he was bragging at a Holiday Inn in New
                                                                 designation of the site, I mean what we classed as
                                                             6
    London in 2006 that he aided Ambro in doing it, and
                                                             7
                                                                 Eastern Long Island Sound versus outside of Eastern
8 his name was all over the coastal zone management
                                                             8
                                                                 Long Island Sound had nothing to do with political
9
    sheet, and he happens to be employed by NY DOS, and
                                                             9
                                                                  jurisdictions and boundaries.
10
   both of these were sneak attacks without any
                                                            10
                                                                                   MR. SPICER: The Corps put $7
11 particular notice to Connecticut's waterfront
                                                            11
                                                                 million of signs in by 2005 and then got a political
12 stakeholders.
                                                            12
                                                                 decision where something was rammed down our throat
13
                                                            13
                      And I also have a document from NOAA
                                                                 here in Connecticut, and people weren't happy, and
14
   that says that they were very surprised that
                                                                 during the midst of this NOAA was kind of surprised.
                                                            14
    Connecticut didn't object to New York's -- or it
                                                                 It seemed to me that nobody objected.
15
                                                            15
16
   seemed that way to me -- coastal zone management. But
                                                            16
                                                                                   But when I got to DEP, I found that
17
    you know what? There weren't any comments against
                                                            17
                                                                 Gina McCarthy knew all about it, and she did find a
18
   that being extended. You know why? We didn't know
                                                            18
                                                                 way on one of the other things to shut me up. There
19
    about it, because I believe that rumor has it, and the
                                                            19
                                                                 was a letter from her deputy, Amy Marella, that told
20
    best information I can get was they're supposed to
                                                            20
                                                                 me to -- you know, I kind of got stabbed in the back
                                                             21
21
   notify the Army Corps of Engineers.
                                                                  about Ambro, and she had a way of shutting me up that
22
                      What Army Corps of Engineers did
                                                            22
                                                                 was interesting. She looked me in the eye --
23 they notify? New England? No. It's believed they
                                                             23
                                                                                   MS. BROCHI: I apologize on behalf
24 sent it to New York. I can't prove that, but I sure
                                                            24
                                                                 of the agency --
   know that there wasn't anything that I can find that's
                                                            25
                                                                                   MR. SPICER: Wait a minute. She
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                                                                                                                Page 72
                                                                                   MS. BROCHI: So if you want to
1 looked me in the eye and she said I wrote it. That's
                                                             1
                                                                 submit official comments to DOS, Jennifer Street would
2 I, Gina McCarthy, wrote it. So I shut up. If it was
3 a man, I'd address her in spades. A woman, I shut it
                                                             3
                                                                 be the contact.
    up and turned around and decided that I had been
                                                                                  MR. SPICER: At the moment I have
                                                             4
   really stabbed in the back --
                                                             5
                                                                 cooperated, because I am being threatened standing on
6
                      MS. BROCHI: So --
                                                             6
                                                                 my air hose and I'm a diver. That I would go to
7
                      MR. SPICER: -- and I haven't shut
                                                             7
                                                                 Central this time, but that doesn't mean that they
8
                                                             8
                                                                 don't come in here and be honest with the folks.
    up since.
9
                      MS. BROCHI: So one other point that
                                                             9
                                                                                   MS. BROCHI: Right.
10
   you made was about the DOS coastal zone consistency,
                                                            10
                                                                                   MR. SPICER: You got to tell them.
11
   and so they do have that authority. If anything is
                                                            11
                                                                 In short, we have been jocked a couple times.
12 abutting, they can make comments on projects. Project
                                                            12
                                                                                  MS. BROCHI: Thank you.
13
   specific review happens within the regulatory agencies
                                                            13
                                                                                   DR. BOHLEN: Susan.
    and the Corps and EPA will handle that separately.
                                                            14
                                                                                   DR. HAY: I want to get some more
   This meeting is about the SEIS, do you have any
15
                                                            15
                                                                 comments, though.
16
    questions specifically about this effort?
                                                            16
                                                                                   MS. BURNS: Kathleen Burns, CMTA. I
17
                      MR. SPICER: Yep, I do have it --
                                                            17
                                                                 just wanted to follow-up on JJ's point when you were
18
                      MS. BROCHI: -- process --
                                                            18
                                                                 discussing impacts that would be weighted, the impacts
19
                      MR. SPICER: -- specific with NY
                                                            19
                                                                 that you are or not impacts, I apologize, but the
20
   DOS.
                                                            20
                                                                 different, the various studies that will be entered
21
                                                                 into this impact study. Are those weighted?
                      MS. BROCHI: Okay.
                                                            21
22
                      MR. SPICER: They're inconsistent.
                                                            22
                                                                                   MS. BROCHI: Sorry, could you just
   Did they say where in New London NLDS is? NLDS is in
                                                            23
                                                                 say your affiliation?
   Fishers Island Sound.
                                                            24
                                                                                   MS. BURNS: Oh, I'm sorry,
25
                      MS. BROCHI: We --
                                                            25
                                                                Connecticut Marine Trades Association. So there is
                                                                                                                Page 73
                                                   Page 71
                      MR. SPICER: Some others have made
                                                                 the physical. There is the biological. You had
2
    some errors, but that one may be crucial.
                                                             2
                                                                mentioned economic. What else is weighed in there?
3
                      MS. BROCHI: Okay. So we do have a
                                                             3
                                                                                  DR. HAY: Archaeological.
                                                                                  MS. BROCHI: Archeological,
   representative as part of our cooperating agency group
                                                             4
5
    here today. Mike Zimmerman is here. Can you speak to
                                                             5
                                                                cultural, economic. Then --
    any of this or should they -- is there somebody else
                                                             6
                                                                                  MR. JOHNSON: Capacities.
7
                                                             7
    you can refer them to?
                                                                                   MS. BROCHI: Capacities is part of
8
                      MR. ZIMMERMAN: Well, is there a
                                                             8
                                                                 the development. It's not really weighted.
                                                             9
9
    specific question, I guess?
                                                                                  MS. BURNS: Are these weighted in
10
                      MR. SPICER: There is a statement
                                                            10
                                                                 any sort of fashion?
11
   that they have made contentions that are incorrect.
                                                            11
                                                                                   MS. BROCHI: No. The data is all
12
                      MS. BROCHI: So that --
                                                            12
                                                                 collected. The site screening process is what we go
13
                      MR. SPICER: They have had plenty of
                                                            13
                                                                 through, evaluating where the sites are. So that's --
14 practice at making incorrect ones, and I have
                                                                 it's not weighted. It's more of a screening tool that
                                                            14
    corrected them on numerous occasions, and I think we
                                                                 we use. The final document will evaluate all of those
                                                            15
   need to put it on record here that NLDS is in Fishers
                                                            16
                                                                 equally.
                                                                                   DR. BOHLEN: But -- I don't know
17
   Island Sound and is 404 waters, and they have admitted
                                                            17
18 it, and I call it if it was legal, it's an admission
                                                            18
                                                                 anything about evaluating documents. I'm saying if
19
    against interest. Where they have admitted, it's
                                                            19
                                                                 you came in here and you said a site that you are
20 northeast of the eastern basin of Long Island Sound.
                                                            20
                                                                 going to use is already full, that makes that
21
                      MS. BROCHI: Okay. So, Mike, would
                                                            21
                                                                 classification pretty way up.
22 it be appropriate for Jennifer to receive something
                                                            22
                                                                                  DR. HAY: Similarly if you had a
23
   then?
                                                            23
                                                                 site that's on a shellfish bed, that would be --
24
                      MR. ZIMMERMAN: I'm sure she would
                                                            24
                                                                                  MS. BROCHI: Right. That's part of
  be happy to.
                                                                the screening, too.
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1
                                                                  looking at all of them, and we won't make a decision
                      MR. HELBIG: Jean, Frank, Ron
    Helbig.
                                                                 until we evaluate all of --
2
                                                              2
                                                             3
                                                                                   MR. HELBIG: But you don't want to
3
                      COURT REPORTER: I'm sorry, sir,
4
    your name again?
                                                             4
                                                                  share an opinion at least or --
5
                      MR. HELBIG: Ron Helbig, Connecticut
                                                             5
                                                                                   MS. BROCHI: I do not want to share
6
    Marine Trade Association, and the whole discussion has
                                                              6
                                                                  an opinion.
                                                             7
7
   been about physics and about the stress on the bottom
                                                                                   MR. HELBIG: Okay. I get that.
8
   and site 6. Can either one of you talk to the effect
                                                             8
                                                                                   MS. BROCHI: Sorry.
9
    that why is site 6 not considered a very good site
                                                             9
                                                                                   DR. HAY: Sir, go ahead.
10
   based on all the data that you have here and the lack
                                                             10
                                                                                   MR. SHAPIRO: My name is Jeffrey
11
    of stress that's on that site and speak to the fact
                                                             11
                                                                  Shapiro. I'm from Cedar Island Marina. My concern is
12 that why that shouldn't continue to be a designated
                                                             12
                                                                  with the grade size used for your modeling, as the
13
    site?
                                                             13
                                                                  gentleman back here spoke about, was a sandy material,
14
                      MS. BROCHI: So I will take that, if
                                                            14
                                                                  and in my experience almost all of the material that {\tt I}
15
   you don't mind.
                                                            15
                                                                  see that goes out of waterfront facilities in
                                                                  Connecticut is a lot siltier material. Siltier
16
                      DR. BOHLEN: Yeah.
                                                            16
17
                      MS. BROCHI: So, again, so the part
                                                             17
                                                                  material is going to be much more stable then the way
   of the effort is to look at all of the sites, and what
                                                            18
                                                                 you were talking, much more stable on the bottom than
    I had presented originally is we had started, you
                                                             19
                                                                 a sandier material.
   know, just eastern, open wide. We decided to go to
                                                             20
20
                                                                                   So my only concern is with some of
21
   historic sites, because we really weren't familiar
                                                            21
                                                                 the evaluations you have done that you might tend to
22
   with what had gone on there, and the Corps of
                                                             22
                                                                 come to a conclusion that the material is going to
   Engineers had helped us.
                                                                  move when in fact if you had used siltier material for
                                                             23
24
                      So we included historic sites. We
                                                             24
                                                                 your examples, you might come to a different
25 included active sites, which includes the currently,
                                                             25
                                                                  conclusion, the conclusion that the material is not
                                                    Page 75
                                                                                                                 Page 77
1 currently used sites. And so part of the
                                                                 going to move.
   investigation is to look at all of the data. This is
                                                             2
                                                                                   DR. BOHLEN: Okay.
3
   the first big chunk of data, and so we narrowed it
                                                             3
                                                                                   MR. SHAPIRO: Like I said in
   down to the six sites, and so all of those six are
                                                             4
                                                                 Connecticut most of the material I see going out is a
5
    going to be evaluated. So we're in the process of
                                                              5
                                                                 lot siltier, because if somebody has a waterfront
    collecting data on all of those.
                                                                  facility and they have sand that needs to be removed,
                                                              6
7
                      MR. HELBIG: My only question to you
                                                             7
                                                                  they're probably not going to be putting it in the
8
   is just here tonight can you say from an educated
                                                             8
                                                                 barge and dumping it out to sea. They're going to be
    opinion that the site 6 is something that we should be
9
                                                             9
                                                                  selling it to somebody. So that's my comment is that
10
    strongly fighting for because of the temperament of
                                                             10
                                                                 maybe --
11
   the currents on the bottom and the ability for the
                                                             11
                                                                                   DR. BOHLEN: I guess my response to
12
   material to stay in that location?
                                                            12
                                                                  that is don't get ahead of yourself.
13
                      MS. BROCHI: So what I can -- I
                                                            13
                                                                                   MR. SHAPIRO: Okay.
14
   don't -- I can't prejudge, and we have to evaluate all
                                                            14
                                                                                   DR. BOHLEN: And hear what was said.
    of the data as it comes in so -- but what I can say is
                                                                 This is the study of the physics of the field and the
15
                                                            15
   based on the physical stress and what we set out in
                                                             16
                                                                  development of a model that allows us to evaluate
17
    the Notice of Intent to look at is a containment site
                                                            17
                                                                  transport. You did a straw man evaluation. You went
                                                                  and picked a number. It ain't 10 and it ain't 0. How
18 for the type of sediment that's in Long Island Sound
                                                            18
19
    and based on the dredging needs report that the Corps
                                                            19
                                                                  about 0.75? Where did 0.75 come from?
20
    of Engineers produced in 2009.
                                                             20
                                                                                   Joe Germano did some work down in a
21
                                                             21
                                                                  site down in Long Island Sound, and his numbers come
                      Based on that report we determined,
22 when we came out with the Notice of Intent, that we
                                                            22
                                                                 up looking like 0.75. There is a study in the North
23 would look for a containment site. Cornfield Shoals
                                                             23
                                                                  Sea that -- the numbers come up looking like 0.75.
24 is clearly -- and this proves it -- a dispersive site.
                                                             24
                                                                  It's not 1 and it's not 0.25. Okay. So we used it
```

So we're -- we need a containment site, and we're

for screening. If it was this absolutely, what would

```
Page 78
                                                                                                                  Page 80
    we be seeing? It's the beginning of the process.
                                                                 all had to have that tested specifically. Couldn't
                      The next step in this whole thing is
2
                                                                 you plug those exact numbers into your model so that
    to refine it, and that's where the model starts coming
                                                                 we would get a more realistic idea of what's being put
3
                                                              3
    in where you really do take a look at how the sediment
                                                                  into Cornfield Shoals rather than judging it as sand?
                                                              4
   is responding. You give me a much more complete set
                                                                  I know I'm not putting sand in Cornfield Shoal. It's
                                                              5
    of data than grain size. I want both density, bulk
                                                              6
                                                                  a fine sediment, and that's on record with the DEP.
7
    density, I want sediment characteristics that go
                                                              7
                                                                                   DR. BOHLEN: I'm sorry, you're not
8
   beyond simple grain size, and I can then talk to you
                                                                 putting sand in Cornfield Shoal.
                                                              8
9
    about not this particle-by-particle movement that you
                                                              9
                                                                                   MS. MCALLISTER: It's a fine
10
   were looking at in this first slide, which is
                                                             10
                                                                  sediment, because we have to have it tested every time
11
    unrealistic given all of the sediments I have seen in
                                                             11
                                                                  we dump there.
12 Long Island Sound but on the beach. If I'm off the
                                                             12
                                                                                   DR. BOHLEN: Well, you can get --
13
   beach, I got gooey stuff even if it's sandy, okay?
                                                             13
                                                                                   MS. MCALLISTER: Every two years we
14
                      We build that into the model, and we
                                                             14
                                                                 dredge.
15
   come up with a much more accurate and quantitative
                                                             15
                                                                                   DR. BOHLEN: What's the use of the
16
    evaluation of the transport potential. What you are
                                                                 Cornfield Shoals area? George?
                                                             16
17
    looking at right now is just the beginning, screening.
                                                             17
                                                                                   MR. WISKER: Cornfield is a
18
    It's the beginning.
                                                             18
                                                                 dispersive site.
19
                      MS. BROCHI: And I'm going to add to
                                                             19
                                                                                   DR. BOHLEN: And what's the major
20
   that a little bit. So this effort is to designate one
                                                             20
                                                                  source of the material that goes into Cornfield Shoals
21
   or more or none disposal sites, right, dredged
                                                                 historically?
                                                             21
22 material disposal sites. It doesn't mean
                                                             22
                                                                                   MR. WISKER: Connecticut River.
   automatically that dredging will happen, that projects
                                                             23
                                                                                   DR. BOHLEN: Connecticut River
   will go out there. That happens from the regulatory
                                                             24
                                                                  sediment.
25 agencies on a project-by-project basis all the time so
                                                             25
                                                                                   MS. MCALLISTER: We're not putting
                                                    Page 79
                                                                                                                  Page 81
1 we're very familiar. The Corps of Engineers are back
                                                                  sand --
   there, the EPA. I review the projects. We're very
                                                              2
                                                                                   DR. BOHLEN: I know you are not
3
   familiar with the type of sediment in Long Island
                                                              3
                                                                 putting sand, George.
   Sound and the dredging needs.
                                                              4
                                                                                   \ensuremath{\mathsf{MR}}. WISKER: It's not always sand.
5
                      Now, one thing I had mentioned
                                                              5
                                                                                   MS. MCALLISTER: We know exactly
   earlier is the DMMP effort, which is separate from
                                                              6
                                                                 what has been put there. Couldn't we use those
    this. Well, as part of that effort they collected
                                                              7
                                                                  (inaudible)? Wouldn't that give us a better idea of
8 information on dredging needs. They looked at upland
                                                              8
                                                                  iust --
    disposal and other beneficial uses and alternatives.
                                                              9
                                                                                   DR. BOHLEN: And we can also look at
9
10
    Those documents are also going to be used in this
                                                             10
                                                                  the mounds at New London the same way and the mounds
11
   evaluation. And so whenever they're, you know -- the
                                                             11
                                                                  at central Long Island Sound the same.
12
    object is to try to use sandy materials beneficially
                                                             12
                                                                                   MS. MCALLISTER: We have done so
    wherever, whenever possible.
                                                             13
                                                                 much research it would seem that it would be easy to
13
14
                      DR. HAY: Okay.
                                                             14
                                                                 pull that into this whole thing.
                      MR. SHAPIRO: Not too often.
15
                                                             15
                                                                                   DR. BOHLEN: I forgot to tell you 45
16
                      MS. MCALLISTER: Abbie McAllister,
                                                             16
                                                                 years. Did I tell you that?
   Saybrook Point Marina. We're basing -- the people who
17
                                                             17
                                                                                   MS. MCALLISTER: I believe it. I'm
18
   are going to be basing their decisions on things like
                                                             18
                                                                  just saying it seems like you have taken such detail
19
   Cornfield Shoals based on your model that you
                                                             19
                                                                  with everything else that it would be not that much
20
    completed when it seems with all the data you have we
                                                             20
                                                                  more difficult to use what's been approved for that in
21 have specific data on what type of sediment has been
                                                             21
                                                                  the past.
   disposed at Cornfield Shoals for the last, I don't
                                                             22
                                                                                   DR. BOHLEN: And we are and we are.
23
    know, 20 years --
                                                             23
                                                                                   DR. HAY: Yes?
24
                                                                                   MR. MCGUGAN: Hi, Christian McGugan,
                      DR. BOHLEN: Sure.
                                                             24
25
                      MS. MCALLISTER: -- because we have
                                                             25 Gwenmor Marina and Gwenmor Marine Contracting. One
```

Page 82 Page 84 thing I was wondering -- I think this kind of speaks feasibility includes those sites. The 11 sites are all within the coastal zone management consistency and 2 to what Bill Spicer was talking about -- are any of 3 these proposed sites outside, because I don't even that's Connecticut and New York. So either Mike or 3 know what the delineation is between a coastal zone 4 George, if you have any specific information? To my 5 management area and a non-coastal zone management 5 knowledge there is no -- you know, there is no yardage 6 area? or mileage that, you know, gives you preference to 7 And the reason I ask are any of 7 being able to object or not. It's whether it's 8 these sites outside of the coastal zone management, 8 abutting and whether it's in danger. because I think the fear is that the recent trend of 9 MR. WISKER: I think what we're 10 DOS objecting to all the projects in southeastern 10 getting is within Long Island Sound it's either, you 11 Connecticut, because Bill's was the first, and we have 11 know, they're all territorial waters of one or the 12 heard the storms coming, and it seemed like it's 12 other state. Boundary lines match. An example of 13 coming. They used to just sit on their comment for 13 where you might be outside of the coastal zone is say 14 180 days and then Army Corps would assume consistency 14 Rhode Island where you got far enough off into the issue of the permit. 15 15 territorial seas beyond the state territorial limits. 16 Well, things they seem to have 16 Then -- and that may be where it would apply. You 17 changed starting with Bill, and like I said we have 17 would have to go quite a ways off shore, open water. 18 heard the rumblings that this is coming. So 18 MR. CAREY: You have to get away 19 effectively what they have done for private projects 19 from Rhode Island's territory. 20 is shut down the New London dump site, okay? Now, I'm 20 MR. WISKER: That's what I'm saying. a dredge contractor. I have projects on the 21 21 You have to go out and hang a right. So that would be 22 Connecticut River including Abbie's. 22 the one way you would avoid, because under the Federal 23 I was telling her today next time consistency laws the two states within Long Island 23 24 she dredges, Saybrook Point Inn dredges, you probably 24 Sound if there is a reasonable, foreseeable effect of 25 are going to have to go to Central, because New York 25 a project in one state on another, that other state Page 83 Page 85 1 is going to object. So I guess the fear is that you has the right to remove that for consistency with that guys do all this hard work and come up with this new 2 program. 3 site or these new sites, and we say hooray. We have a 3 MS. BROCHI: Thank you. MS. MCKENZIE: Tracey McKenzie 4 place to go. 4 5 We apply for our permits to dredge, 5 again. Just to follow up the question with you, and New York can still just object, and that sets off George, because the New London disposal site now, a 6 6 an appeal process and a legal process that no small 7 corner of it, the boundary of New York and Connecticut 8 marina operator can bear, and no small marina operator 8 goes right through, I think, like the lower third corner of --9 can bear to go to central Long Island with their 9 10 spoils, and I have been to some of those dredge 10 MR. WISKER: Southeastern. 11 management meetings, but I can barely stomach it as a 11 MS. MCKENZIE: Southeastern corner 12 dredge contractor, which I'm sure Jeff knows as well. 12 of it. If the site was shifted so it's not on the 13 13 boundary line, New York would still be able to comment When they talk about alternative 14 disposal methods, I mean, there is electric cars 14 on the coastal action that Connecticut DEEP takes. 15 invented in the '50s, but we're still filling up with MR. WISKER: Right. 15 16 gasoline. That's the best analogy I can make. So as 16 MS. MCKENZIE: I just want -- that's 17 far as the affordability of getting rid of dredge 17 all. 18 spoils in these other crazy ways that I have heard, 18 DR. HAY: Tracey, what is your 19 it's just not reality. 19 affiliation. 20 So anyway, I think that's the fear. 20 MS. MCKENZIE: U.S. Navy Subbase, 21 So are any of the proposed sites -- is there anyone in 21 New London. 22 this room from Army Corps? Are they all going to be 22 MS. BROCHI: Does that answer your 23 within the coastal zone management, and this could all 23 question? 24 just be --24 25 MS. BROCHI: So the zone site of 25 MR. MCGUGAN: Just for the record,

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Page 86
                                                                                                                 Page 88
1 to go to New London for Bill Spicer, the cost for him
                                                                 going to get up here, you know, and talk about, you
                                                                 know, the displacement or anything like that. So how
2 to try to go to Central with the same material,
3 because I was his dredge contractor, and I'm not here
                                                             3
                                                                 can you guys talk about business?
4 because I'm sore about not dredging this job. It's a
                                                             4
                                                                                   MS. BROCHI: You will have an
   much bigger issue to me. The difference between going
                                                             5
                                                                 opportunity to comment about --
6
    to New London or going to Central with this stuff is
                                                             6
                                                                                   MR. SHAPIRO: No, no. Who on your
    more than double the cost for a marina operator.
7
                                                             7
                                                                 who is actually putting together the actual
8
                      So it's going to be a huge burden on
                                                             8
                                                                 recommendations?
9
    the marinas in southeastern Connecticut, and the
                                                             9
                                                                                   MS. BROCHI: Yeah, well, so the
10
   Connecticut River is like coming. So I guess
                                                            10
                                                                 recommendations come from the agency and the
11
    somehow --
                                                            11
                                                                 cooperative agencies, but the working group that was
12
                                                                 set up for the DMMP has nonregulatory and nonagency
                      DR. BOHLEN: When you say cost, you
                                                            12
13
   are including all factors in the cost. It isn't just
                                                                 specific focus on it that we're going to tap into as
                                                            13
14
    dollars.
                                                            14
15
                                                            15
                      MR. MCGUGAN: Right. Well, I have
                                                                                   MR. SHAPIRO: So there are people
16
   actually done --
                                                            16
                                                                 from the business side, too.
17
                      DR. BOHLEN: Is that right --
                                                            17
                                                                                   MS. BROCHI: Yeah.
18
                      MR. MCGUGAN: We have done trips.
                                                            18
                                                                                  MR. SHAPIRO: Obviously this is very
19
    Ron, he couldn't because (inaudible) is too shallow.
                                                            19
                                                                 important, you know, but there obviously needs to be
20
   So we did a couple loads and tried to be as nice as I
                                                            20
                                                                 some professionals, you know, that understand, you
21
   could, but, man, it's a long trip. It's 24, 26-hour
                                                                 know, the economic, you know, impacts. I know that
                                                            21
22
    cycle to get out to New Haven and back. So it's just
                                                            22
                                                                 you guys are probably very smart, but there needs to
    -- that's the economics of it. It's just like, you
                                                                 be professionals, you know.
24 know, you are digging with a wheelbarrow in your yard.
                                                            24
                                                                                   DR. HAY: We have an economist on
25 You are going right there, and you are going to your
                                                            25
                                                                 board as well.
                                                    Page 87
                                                                                                                 Page 89
   neighbor's house. It's just --
                                                             1
                                                                                   MR. SHAPIRO: Can you give me their
2
                      MS. BROCHI: All of the regulatory
                                                             2
                                                                 names?
3
   agencies and cooperative agencies understand the
                                                             3
                                                                                   COURT REPORTER: I'm sorry?
4
    economic impact, but the State doesn't.
                                                             4
                                                                                   DR. HAY: Ben Lieberman.
5
                      MR. MCGUGAN: Well, I think New York
                                                             5
                                                                                   MR. SHAPIRO: Ben Lieberman?
   and Connecticut needs to get along or -- maybe
6
                                                             6
                                                                                   MS. BROCHI: So on the working
7
    Connecticut needs to understand what is acceptable.
                                                             7
                                                                 group, Mark, do you know when the next working group
                                                                 of the DMMP would be established or --
8
                      DR. HAY: So it's 5 o'clock. We
                                                             8
    started five minutes late so let's allow for five more
                                                             9
                                                                                   MR. HABEL: Probably about the time
10
    minutes, so maybe two more comments that are burning.
                                                            10
                                                                 we publish the draft of the DMMP.
11
   Sir?
                                                            11
                                                                                   MS. BROCHI: So Mike Keegan would be
12
                      MR. SHAPIRO: My name is Chris
                                                            12
                                                                 the contact.
13 Shapiro from Cedar Island Marina. Is just hasn't --
                                                            13
                                                                                   MR. SHAPIRO: Okay. I'd just like
14
   maybe there is an answer to this, but it hasn't been
                                                            14
                                                                 to ask --
    entirely clear to me. You say, you know, in the
                                                            15
                                                                                   DR. BOHLEN: Did I hear -- Jean, you
   calculations, you know, there is going to be a lot of
                                                            16
                                                                 said after the DMMP or after --
                                                            17
17
    variables, you know, such as economic, you know,
                                                                                   MS. BROCHI: No, the Dredge Material
18
   commercial, that type of thing. Who on your team is
                                                            18
                                                                 Management Plan.
19
    going to be considering those variables?
                                                            19
                                                                                   DR. BOHLEN: What's the date for the
20
                      MS. BROCHI: Well, there is
                                                            20
                                                                 release of the Dredge Material Management Plan?
                                                            21
21 individual people at EPA as well as the Corps of
                                                                                   MR. HABEL: It will be sometime in
22 Engineers and all --
                                                            22
                                                                 the spring.
23
                      MR. SHAPIRO: Well, you guys are
                                                            23
                                                                                   MR. JOHNSON: Of 2015?
   scientists. Who from the business side is going to be
                                                            24
                                                                                   MR. HABEL: Yes.
    considering this? I mean, surely, you know, I'm not
                                                            25
                                                                                   DR. BOHLEN: I know there was some
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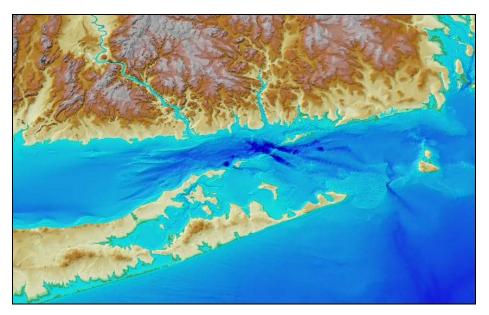
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Page 90
    questions on that that had been circulating.
 2
                      DR. HAY: One final question?
3
   Comments? Okay. Thank you all for coming. Have a
    great afternoon.
 4
 5
                       (Whereupon, this hearing was
 6
                       concluded at 5:10 p.m.)
 7
 8
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23
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25
                                                    Page 91
1
                       CERTIFICATE OF REPORTER
2
            I, Jacqueline V. McCauley, a Notary Public
 3
    duly commissioned and qualified in and for the State
   of Connecticut, do hereby certify that the
  Supplemental Environmental Impact Statement(SEIS) to
6
   Evaluate the Potential Designation of One or More
  Dredged Material Disposal Site(s) in Eastern Long
    Island Sound hearing was taken on December 9, 2014 at
    3:08 p.m., and reduced to writing under my
   supervision; that this hearing is a true record of the
10
11 testimony given during the hearing.
12
            I further certify that I am neither attorney
13
  nor counsel for, nor related to, nor employed by any
14
  of the parties to the action in which this hearing is
15
   taken, and further, that I am not a relative or
    employee of any attorney or counsel employed by the
16
17
   parties hereto, or financially interested in the
18
    action.
19
            IN WITNESS HEREOF, I have hereunto set my hand
    and affixed my seal this 18th day of December, 2014.
20
21
                                   Jacqueline V. McCauley
22
23
                                    Notary Public
24
    My Commission expires: 12/31/2017
25
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Appendix A-6

MINUTES OF COOPERATING AGENCY GROUP MEETING 1

Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Sites in Eastern Long Island Sound, Connecticut and New York

Minutes of Cooperating Agency Meeting 1



Prepared for: United States Environmental Protection Agency

Sponsored by: Connecticut Department of Transportation

Prepared by: Louis Berger

with support from

University of Connecticut









January 2013





Eastern Long Island Sound – Supplemental EIS



Cooperating Meeting 01 – Minutes

TOPIC: Preliminary Site Screening and Physical Oceanography Study Plan

DATE OF MTG: January 8, 2013

LOCATION: CTDOT, 2800 Berlin Turnpike, Newington, CT

TIME: 10:00am to 2:27pm

PARTICIPANTS: Cooperating Agencies

 Joe Salvatore Connecticut Department of Transportation US Environmental Protection Agency, Region 1 Jeannie Brochi US Environmental Protection Agency, Region 1 Alicia Grimaldi George Wisker Conn. Dept. of Energy and Environmental Protection US Army Corps of Engineers, New England District Cathy Rogers Mark Habel US Army Corps of Engineers, New England District US Army Corps of Engineers, New York District Nancy Brighton Diane Rusanowsky NOAA/National Marine Fisheries Service

Patricia Pechko
 Patricia Pechko
 US Environmental Protection Agency, Region 2

Jim Leary
 Kari Gathen
 Jennifer Street
 New York State Department of State
 New York State Department of State

Jeff Willis Rhode Island Coastal Resources Management Council

UConn Project Team (under contract to CTDOT)

James O'Donnell University of Connecticut

Carlton Hunt
 Lynn McLeod
 Lisa Lefkovitz
 Battelle
 Battelle

Bernward Hay
 The Louis Berger Group, Inc. (Prepared minutes)

SUBMITTED ON: January 15, 2013

The primary goal of the meeting was to review (1) the Zone of Siting Feasibility (ZSF), (2) preliminary site screening, and (3) the plan for the physical oceanographic study, in preparation for the Eastern Long Island Sound (ELIS) Supplemental Environmental Impact Statement (SEIS).

Presentations are provided as separate pdf files; individual *Slides* of these presentations are referenced below.

Introduction (Jeannie Brochi, USEPA)

Jeannie Brochi stated that this was the Cooperating Agency kickoff meeting (her presentation is attached as Appendix A):

• Ms. Brochi asked if other agency member representatives should be asked to be involved. As required under NEPA, letters were sent out in July asking agencies to participate as either a Cooperating Agency or Coordinating Agency. There are some agencies (Navy, Coast Guard) and five tribes that have not yet confirmed participation. Confirmed are the States of Connecticut (CT), New York (NY), and Rhode Island (RI); both divisions of the USACE; and NOAA NMFS.

- Being a Cooperating Agency allows for involvement in all major milestones, document reviews, and helps USEPA conduct the effort. Jeannie Brochi reviewed the EIS process (*Slide 5*), and introduced the USEPA website available for public communications (*Slide 6*).
- Participants were asked to identify data gaps in the preliminary information presented at today's meeting. Feedback was requested by January 18, 2012, on the ZSF, the screening, and the planned physical oceanography study (sampling locations, data collected, etc.). Also, any relevant available information and data on resources in the ELIS were requested. The ZSF (*Slide 9*) for the SEIS has been expanded to encompass the eastern area of the Dredged Material Management Plan (DMMP), to be able to use its information and reports (the DMMP study area is specified in *Slide 8*).
- Aside from the DMMP, the SEIS will include information from the EIS for Central and Western LIS, the USACE DAMOS monitoring program, and USEPA data generated between 2007 and 2012 (OSV Bold cruises). The Dredging Needs report (2009) estimated that approximately 13.5 million cubic yards will need to be dredged by 2028 in LIS's harbors and channels; the report is one of the starting points for the SEIS.
- Projected completion dates are December 2014 for the Draft SEIS, December 2015 for the Final SEIS, and December 2016 for rule-making (if the SEIS recommends designation of one or more sites). December 2016 is also the date when the Cornfield Shoals and New London Disposal Sites will close.

Zone of Siting Feasibility and Preliminary Site Screening (Presentation by Lynn McLeod, Battelle)

Lynn McLeod explained the ZSF for the ELIS and the process used in Central and Western LIS site screening for candidate alternative dredged material disposal sites, adapted for Eastern LIS (her presentation is attached as Appendix B):

- Information from the original ZSF developed years ago for the entire LIS and the revised boundary used in the Western and Central EIS was used as a starting point for the ELIS (*Slide 2* shows its boundaries). The eastern boundary was expanded slightly to the east to include the DMMP boundary (*Slide 3*).
- The objective of the screening (*Slide 4*) is as follows:
 - o Identify areas within the revised ZSF acceptable for locating an open water disposal site designated under the Ocean Dumping Regulations, and
 - Identify specific alternative disposal site(s) within the acceptable area(s) for further evaluation in the SEIS.
- In general, the screening approach followed the Marine Protection, Research, and Sanctuaries Act (MPRSA) disposal site designation criteria, as outlined in *Slide 5* and in a handout on *Considerations in the Evaluation and Designation of Ocean Dredged Material Disposal Sites*, and on *Ocean Dumping References* used for the Central and Western LIS site screening (Tables 1 and 2, provided below).
- Screening criteria were prioritized into Tier 1 and Tier 2. Tier 1 criteria rule out areas that are unacceptable for open water disposal. Tier 2 criteria identify specific locations for alternative sites.
- Tier 1 criterion Sediment stability/instability (Slide 6): Includes information such as bathymetry (Slides 7; depth contours are in meters). Slide 8 shows ELIS bathymetry with depths of 18 meters and shallower 'blacked-out'; such depths were considered not suitable for potential disposal sites during the Central and Western LIS screening. Preliminary model estimates of the maximum bottom stresses due to tidal currents are shown in Slide 9; higher stresses (red) reflect higher sediment erosion potential. Data from the physical oceanography surveys will assist with this criterion.

- *Tier 1 criterion Disposal feasibility (Slide 10):* Includes water quality perturbations and near-term fate; this issue will be worked on over the next six months.
- *Tier 1 criterion Areas of conflicting uses (Slides 11 and 12):* Includes beaches and amenities, utilities, etc. The data layer presented requires updating. Any information from the Cooperating Agencies would be welcomed.
- *Tier 1 criterion Shellfish and fishing (Slide 13 to 15):* Shellfish bed information was available for the CT coastline; the same type of information is requested for NY and RI. Fishing layers were obtained from the RI SAMP program.
- Tier 1 criterion Navigation (Slides 16 to 18): The report entitled U.S. Coast Guard Captain of the Port Long Island Sound Waterways Suitability Report for the Proposed Broadwater Liquefied Natural Gas Facility provided data on ship traffic density and commercial vessel navigation (e.g., ferries).
- Tier 1 criterion Marine habitats and high dispersion potential (Slide 19): Questions to consider include the following: Are gravel and hardbottom habitat (considered important marine habitat for the Central and Western LIS) also important for the ELIS? What type of site shall be considered for ELIS (containment and/or dispersive)? The sediment characteristics (Slide 20) provide an indication of the type of habitat that may exist. Sediment texture appears to correspond to shear stress (Slide 21); high shear stress results in coarser texture.
- *Tier 1 Compilation of all Tier 1 screening criteria (Slide 22) -* The compiled map shows areas ruled out within the ELIS (preliminary).
- Tier 2 criteria (*Slides 23 to 25*) are designed to focus on specific alternative sites where impacts to key resources are minimized (such as archaeological resources, fish habitat, benthic community, shellfishing, eelgrass beds, etc.)
- Tier 2 criterion Historic disposal sites and Continental shelf (Slides 26 to 28): During Central and Western LIS screening it was determined that 25 nautical miles (nm) (i.e., about a 10-12 hour round trip) was the maximum distance that dredgers could transport dredged material economically from dredging locations. The 200-m depth contour of the edge of the continental shelf is located outside of the 25 nm zone.
- Tier 2 criterion Prevailing currents (Slide 29): Not considered for this screening yet.
- Tiers 1 and 2 Compilation of all screening information (Slide 30): Ultimately, alternative areas require specific site boundaries based on depth, capacity for dredged material volumes, water quality criteria, buffer zones, etc. (Slide 31).
- Factors to be discussed in SEIS are shown in *Slide 32*.
- Next Steps (Slide 33):
 - o Finalizing criteria for screening (minimum depth, bottom types to avoid; type of site [containment and/or dispersive]; site protection requirements).
 - o Identifying and acquiring more recent or available data to use in the screening. Any data from Cooperating Agencies would be greatly appreciated.
 - o Identifying data gaps and conducting studies to fill them.

Discussion of Preliminary Site Screening (facilitated by Carlton Hunt)

Discussion topics were as follows:

- Process: Carlton Hunt asked if everyone agreed with the process that is being followed, and explained that process meant the sequencing of the analysis. Kari Gathen stated that it was too early and more information and research was needed before agreeing to this process. Carlton Hunt and Jeannie Brochi agreed, and said that, for example, information is needed from NY and RI. Jeff Willis asked if the process has been used elsewhere. Carlton Hunt and Lynn McLeod explained that the process has been used in other locations such as the Central and Western LIS and RI.
- Eastern boundary of ZSF: Carlton Hunt asked if participants were in agreement with the location of the eastern ZSF boundary. Jeff Willis asked why the ZSF was expanded to the east. Jeannie Brochi stated that the boundary was expanded to be able to use DMMP data from dredging centers along the coast of western RI. Mark Habel added that the second factor was distance. Specifically, using a radius of 25 nm as the limiting distance for economically viable disposal from New London (one of the largest dredging centers in CT) implies that Block Island Sound needs to be included in the analysis. For that reason, the area is also part of the DMMP.
- DMMP informing SEIS: Jim Leary asked how the findings of the DMMP (required to be prepared as a condition for the Central and Western LIS site designation) will inform the SEIS. Kari Gathen added that the rules state to eliminate or reduce open-water dredged material disposal. She asked how the SEIS process equates with this rule, and if the DMMP has exhausted the search for all possible out-of-water alternatives. Jeannie Brochi responded that the USEPA is fully on board with 'reduce or eliminate' and DMMP findings will be incorporated into the SEIS process. Mark Habel stated that the DMMP, after several years of input from all the agencies, has looked at all the available not-in-water alternatives. A public draft of the DMMP probably requires another 18 months. However, after looking at the various reports and studies it is clear that, over the long term, dredged material disposal needs in the ELIS cannot be met by the combined capacity of all available not-in-water disposal alternatives. There are plenty of beaches in the ELIS that need sand, but the sediment predominantly being produced in the ELIS is silty. Joe Salvatore added that, for that reason, and given dredging needs and the strategic importance of Connecticut's facilities, the Governor of CT considered it very important to start and expedite the oceanographic study phases of the project.

Jim Leary asked if the assessment of out-of-water alternatives investigated impediments such as local laws or other regulations; he raised the question to understand what laws could be changed to increase out-of-water disposal alternatives over the next 26 years. Mark Habel stated the DMMP work so far has looked at the total available capacity and has not yet screened out such impediments; this screening is likely going to reduce the out-of-water capacity so far considered. Jim Leary suggested that changes in policies may create new out-of-water opportunities and different paths, such as new remediation and treatment technologies, etc.

Patricia Pechko reminded participants that the SEIS process is designed to determine the feasibility of designating a site, not to necessarily designate a site, and secondly, that if a site is designated it will not necessarily be used. The goal for the process discussed in this meeting was to determine if there *is* a suitable area for a site. Kari Gathen stated that she would like to see a companion effort; the State of CT should consider dredged material as an economic development opportunity to create new industries, reuse the material, and jobs and opportunities for people. Such an effort has been successful in NY Harbor. George Wisker stated that the CTDEEP embraces the LEAN concept; ongoing efforts include increasing the beneficial use of soil and sediment. This includes reviewing standards and other steps to make it easier for people to utilize dredged material. Jeannie Brochi asked if any of the cooperating State agencies would be interested in facilitating a review of impediments or opportunities (federal, state, local) in their States. Jeff Willis said that impediments were not an issue in RI, but rather education; RI had not dredged in over 30 years, so it took a long time to educate people about beneficial use alternatives, costs, and time to use such alternative vs. ocean disposal. Jeannie Brochi and Carlton Hunt suggested a parallel process to the site screening that could be added to the next Cooperating Agency meeting as an agenda item.

Patricia Pechko mentioned that the NY Harbor DMMP is a living document that is being reexamined every two years to look for opportunities and remove impediments. Nevertheless, there remains an open water disposal site.

- Appropriate minimum water depth and other available exclusionary information: Carlton Hunt asked if there were any State requirements that rule out certain areas for disposal. Jennifer Street said there are some requirements, such as significant coastal fish and wildlife habitats which are federal designated areas; NYSDOS will provide the information in electronic format to USEPA (Jeannie Brochi and Patricia Pechko). Also, NYSDOS will provide updated navigation information including metadata. Jeff Willis stated that the most recent RI data are already available to USEPA through the recent SAMP study. Jennifer Street mentioned that SeaGrant is moving forward with marine spatial planning, and data may be available; George Wisker will obtain the data once it becomes available. Mark Habel suggested reaching out to the Navy for additional navigation corridors out of Groton.
- Haul distance (25 nm): Carlton Hunt stated that 25 nm was used for the Central and Western site designation screening, and asked if there were any objections to use this distance. None were voiced.
- **Dispersive site:** Carlton Hunt asked if a dispersive site(s) should be considered for ELIS; dispersive sites are allowed under the regulations and the active Cornfield Shoals Disposal Site is considered a dispersive site. Jeannie Brochi added that dispersive sites have also been designated elsewhere in the country. Mark Habel added that there are dispersive sites along the south coast of Long Island. He also stated a threshold of 15% for fines in sediment for direct placement on beaches and nearshore bars has been used for a long time. A higher threshold for nearshore bar placement would open new opportunities for beneficial use; this will be considered for the DMMP.
- **Data gaps:** Carlton Hunt discussed the filling of some of the data gaps:
 - o Sediment transport/erosion to determine the shear stress levels; this will be addressed by the physical oceanography study.
 - O Living resources (shellfishing, fisheries, benthic organisms): Jennifer Street stated many data are available, including data in the New York State Atlas which is a mix of data from different agencies. Carlton Hunt offered to provide NYSDOS with a list of data needed for the screening. Diane Rusanowsky suggested including the Essential Fish Habitat layers; Julie Crocker or Daniel Palmer (NOAA in Gloucester) may have the data (including coordinates). Also, NOAA has listed federally Atlantic sturgeon in recent years which will need to be included in the analysis. Lynn McLeod agreed to send a list of potential screening layer types to NYDOS.
- Alternative uses (wind, coastal planning due to sea level rise, etc.): In response to comments on cumulative impacts, Diane Rusanowsky suggested considering hydrokinetic energy generators as a potential alternative use in the ELIS.

Potential areas for disposal sites (very preliminary): Carlton Hunt suggested considering four areas as a starting point for the discussion on specific areas for further study. One area is located to the north of Montauk Point (>20 m depth; sheltered; muddy bottom sediment). There are deeper holes south of Fishers Island (>50 m depth; within haul distances). The apparent high bottom shear stress areas within ELIS (assuming the site can be dispersive). The fourth area is closer to the Cornfields Shoals site at or near the former Niantic Disposal Site. This kind of discussion is designed to focus on where additional studies may be needed. Nancy Brighton asked if there are sites that may be too deep. Mark Habel responded that the most extensively used disposal site in Massachusetts is 330 feet deep, and placement within it has been very accurate. Only a few sites in ELIS come close to this depth.

The participants did not reach conclusions with respect to potential areas for further study pending presentation of the additional data layers to be provided by NYDOS and others. These updates and discussion will form the basis for the next Cooperating Agency meeting.

Physical Oceanography Study (Presentation by James O'Donnell, UConn)

James O'Donnell presented existing physical oceanographic data and the proposed study for the ELIS (see Appendix C):

- Overview: Bottom shear stress and water circulation which determine the erosion potential and fate of the sediment are key parameters for site designation. To consider all possible sites, reliable data are needed to force and test a model that can interpolate between the limited locations and times for which data are available (Slide 2).
- **Scientific background:** James O'Donnell explained the underlying science for sediment transport, stating in essence that resuspension of sediment particles from the sea floor is a function of sediment grain size and bottom force acting on the particles (*Slides 3 to 5*). The larger a particle, the larger the force needed to resuspend it. Or, stated differently, with increasing bottom stress, increasingly larger sediment particles are resuspended. Forces (and thus bottom stress) are strongest during storms when wind driven circulation and surface gravity waves can augment the effects of tidal and density driven flow (*Slide 6*).
- **Data needs:** The data needed to assess bottom stress are summarized in *Slide 7*. The goal is to assess the stability of sediment at the sea floor for normal and extreme (storm) conditions. The plan is to use field observations to assess the validity of theoretical predictions at selected sites at a range of conditions, and then use the results of the model to compare all possible sites.
- Available data: There are three major recent studies with data for the ZSF (*Slide 8*); James O'Donnell presented some of the data from these and a variety of other sources (*Slides 11 to 27*). Needed data include sea level, wind speed and direction, solar radiation, river discharge based on the extensive USGS network, water column temperature and salinity, currents, and waves. About 90% of the freshwater enters the LIS through the Connecticut River, Housatonic River, Thames River, and Quinnipiac River. About half of the freshwater enters the LIS in the spring (March to May; *Slide 16*).

In summary (Slide 29), seasonal variations in wind and wave patterns and river discharge are substantial. Missing data include the following:

- o No direct measurements of bottom stress data are available.
- o Wave data are only available at the Central LIS buoy.
- o No density variation data north-south in LIS.
- o No hydrography or current profile measurement in Block Island Sound or Rhode Island Sound.
- o Available information identified a windy period from January to March with big waves, and high discharge period from February to May, low wind and low river discharge period in the summer.

Therefore, to evaluate the performance of a model, it should be tested over a period that encompasses the range of characteristic conditions that might be experienced.

Kari Gathen asked about the bottom shear stress in the ELIS. James O'Donnell explained that there is evidence of high bottom stress in ELIS in the form of existing sand waves and the absence of lake sediments, but no direct measurements. Stress levels in the ELIS modeled so far are based on data for sea level and currents and have not been directly compared to measurements.

Carlton Hunt stated that he is aware of another solar radiation data set from the Massachusetts Water Resources Authority; he will connect Jim O'Donnell with the data managers.

• **Proposal for observations** (*Slide 30*): The period October to March include frequent events of high winds from the Northeast (typically about 10 storms per winter). Winds are lighter from May to September. River flow is high from March to May. Considering also variations in currents and waves, three periods are targeted for monitoring (over a total period of six months):

- Windy, low flow (February to March)
- Windy, high flow (April to May)
- o Calm, below average flow (June-July)

James O'Donnell plans to measure salinity and temperature variations (with CTDs, *Slide 34*), currents (with current meters), suspended sediment concentrations (with optical backscatter sensors), and bottom stress (with Acoustic Doppler Current Profilers). Measurements will be made at moored stations (*Slide 33*) and along cruise tracks (four times during the survey period) (*Slide 31*).

The distribution of the maximum bottom stress magnitude (*Slide 32*) has been numerically modeled (using FVCOM, *Slide 35*) based on tides and sea level, as stated above. Planned mooring stations are superimposed on *Slide 32*. Preliminary tidally induced bottom shear stress distributions suggest that the New London Disposal Site is stable because of low stress and infrequent large amplitude waves, and the sediment is coarse enough to not be resuspended by higher stress events. Uncertainties (due to parameter choices) and the effects of infrequent events (hurricanes) can be estimated using the model and available measurements.

Steps to integrate the planned field measurements into the model consist of the following:

- 1. Use observed winds and river flow to drive the model and predict the salinity, temperature, current and waves, and bottom stress.
- 2. Compare to the new and archived observations and evaluate FVCOM performance in the ZSF.
- 3. Describe the uncertainties.
- 4. Simulate the behavior during extreme events. The output is maps of the evolution of bottom stress and circulation along with uncertainties in the estimates.

To predict the effect on natural and deposited sediment, stress and current distribution predictions will be used to drive the models STFATE and LTFATE. STFATE models sediment transport during disposal. LTFATE models long-term transport of resuspended sediment from disposal mounds.

Discussion of Physical Oceanography Presentation (facilitated by Carlton Hunt)

- **Summary:** George Wisker summarized Jim O'Donnell's physical oceanographic study as follows: The purpose of the study is to obtain data that are limited in the scope and time. Data are entered into models that are based on mathematical equations and models are run. These models are then tweaked to reflect the existing observations to calibrate the model. The calibrated model can then be used to assess stress at potential alternative sites including conditions such as the recent Hurricane 'Sandy'.
- Sediment characteristics and bottom stress: Cathy Rogers asked to what extent sediment characteristics is an indication of bottom shear stress. James O'Donnell and Carlton Hunt responded that they are a good first indication of stress.
- Model predictions: Jim Leary asked if October to March is the period with frequent high winds, why the period between August and January is not studied. James O'Donnell responded that funding limits the study period; however, the period February to July is the period during which the highest variability in bottom stress occurs. Jim Leary asked further how the modeling will account for other types of conditions such as climate change effects (sea level rise, increase in frequency of storms, etc.). Carlton Hunt answered that once the model has been calibrated it can be used to determine bottom stress and depth of erosion for a variety of other conditions, such as these types of extreme events. Field station locations have been chosen in a manner to provide data for a range of stress conditions (higher stress as well as lower stress). James O'Donnell added that UConn's implementation of the physical oceanography model (FVCOM) is a state-of-the-art horizontal circulation model; however, this model does not resolve the details of the circulation around the disposal site. It is the role of STFATE and LTFATE to make refined predictions on the scale of the disposal sites.

- Other uses of model predictions: James O'Donnell stated that model allows for high-resolution wave forecasts, which also helps to develop strategies for storm conditions at beaches or exposed shoal areas, or for marsh replenishment projects.
- Multiple storm events: Kari Gathen asked if the models consider different periods of 'recovery' between storms; for example, what happens if several storms occur over a short period of time? James O'Donnell responded that the models are designed to cover a wide variety of conditions. Carlton Hunt added that this kind of issue was addressed in the Central and Western LIS EIS. As described therein, the benthic community typically recovers within a season or two after a storm or a sequence of storms.
- **Disposal site management:** Kari Gathen stated that there is a practice of capping in LIS and asked about the recovery period if capping material was removed during storms. Carlton Hunt stated that all material that is disposed in LIS is acceptable for ocean disposal; capping is a dredged material management activity. If sediment to be dredged does not pass the dredged material testing requirements, it cannot be disposed in the LIS. Joe Salvatore confirmed that the State of Connecticut is choosing to cap many federal as well as private projects even though *all* disposed sediment meets the open ocean water disposal. George Wisker mentioned that the water quality standards of the State of Connecticut specify to use Best Management Practices (BMPs), and capping is a BMP.

Carlton Hunt added that the approach for dredged material management at a site will be included in the SEIS in the form of a SMMP (Site Management and Monitoring Plan). Kari Gathen asked if the model assesses conditions if the cap is washed away. Jeannie Brochi responded that when a site is designated, a SMMP is created and USACE is monitoring these sites through their DAMOS program. Thus, the agencies could determine to place material in certain areas subsequent to a storm to cover up areas that are to be capped. Carlton Hunt added that this type of discussion is important for site screening to determine how a site will be used, what type of material is to be placed, how stable the material shall be, under what conditions it will not be stable, etc. James O'Donnell added that the model can determine if design criteria for specific sites have been exceeded for specific storms, to guide subsequent actions.

• Testing criteria: Kari Gathen asked if there will be further study to determine if the open ocean disposal criteria are truly acceptable for a semi-enclosed waterbody such as LIS. Joe Salvatore replied that DAMOS has many years of data (including data collected after storms) and has not identified any concerns. Mark Habel stated that the model allows for the determination of erosion of a layer of sediment (measured in cm and mm) if exposed to a certain level of stress over a certain period of time. There are historic mounds capped decades ago; these mounds have consolidated and have been winnowed somewhat. The model will be able to determine what it would take to erode sediment from these mounds, for example. Carlton Hunt stated that reevaluating the testing criteria challenges the "Green Book" as well as the Ambro Amendment. Mark Habel stated that under the Ambro Amendment, the federal government will use the open ocean disposal requirements (technical and procedural). Jim Leary asked if there should not be some consideration about differences between placing material in an open ocean vs. more enclosed environment. Mark Habel stated that one way to examine this issue would be to review CTDEEP's BMP approach to see if additional management steps might be considered, even though USEPA and USACE would not require them. Joe Salvatore added that every year, the USACE considers the list of dredging projects from CT and NY projects to

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¹ For the record, Jim Leary stated at the end of the meeting that NYSDOS does not mean to imply they are backing away from the Ambro Amendment, or not applying open ocean criteria for the testing of sediment, but merely asked to consider potential impacts due to the specific physiographic setting of the LIS, outside of what is allowed under the law. Lisa Lefkovitz stated that these types of issues would be addressed in the SEIS.

determine the most suitable disposal sequence.

• Design of study: Carlton Hunt and Jeannie Brochi asked if there are weaknesses in the study setup (timing, frequency, location, measurement type), and if additional information was available for the selection of station locations. Jennifer Street asked if there would be monitoring in Peconic Bay. Jeannie Brochi added that the area was included in the ZSF because it is included in the DMMP study area. Mark Habel recommended not considering Peconic Bay [as a potential disposal site]. Regarding timing of the study, Mark Habel stated that dredging in LIS is restricted between October and April, thus the study should address potential STFATE conditions during the open disposal window (May to September). James O'Donnell stated that conditions for this window should be covered including stratification of the water column in LIS. Mark Habel asked if there should be corrections for mound elevations. James O'Donnell stated that this issue will be addressed by STFATE and LTFATE. Mark Habel stated that field stations were located mostly within high energy areas and asked if stations should be adjusted to get a greater range of energy conditions. James O'Donnell responded he will adjust the stations slightly to include some lower energy areas since containment sites would be located in low energy areas. Diane Rusanowsky suggested not placing stations in areas precluded for potential disposal due to resource concerns. James O'Donnell stated he will consider this, as long as it does not affect the confidence of the predictions of the model, since its goal for the model is to be equally reliable for measurement stations and locations in-between. Cathy Rogers asked if consideration of more lower-end energy conditions would be useful. James O'Donnell responded that if energy is too low it affects the resolution of the model; the approach has been to get a range of conditions biased toward worst-case scenario conditions.

Summary of Key Action Items

- Get State agencies together to identify impediments (e.g., policy) and opportunities for beneficial use. This includes finding out what each State is actively doing to encourage beneficial use.
- States might want to consider increases in thresholds for fines for beneficial use placement.
- Jennifer Street will provide additional GIS data layer on wildlife habitat as well as an ocean map, and the NYS Atlas.
- Jeff Willis will provide information on the Rhode Island process.
- Any other data that might be available: Lynn McLeod/Carlton Hunt stated a list with suggested input data will be prepared and circulated.
- Jeannie Brochi may reach out to agencies directly for some agenda items for future meetings.

Upcoming Schedule

Jeannie Brochi added that there will be additional public meetings as well as one or two more Cooperating Agency meetings in the spring. Data will be collected in the summer. Another public meeting as well as cooperating meetings will occur in this fall. Public outreach will probably occur in the fall using some of the available data.

The meeting was adjourned at 2:27pm.

Table 1. Required considerations in the evaluation and designation of ocean dredged $\,$ material disposal sites (MPRSA 228.5 and 228.6).

MPRSA			
Section	MPRSA Regulation		
228.5(a)	The dumping of dredged material into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.		
228.5(b)	Locations and boundaries of disposal sites will be so chosen that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations of effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.		
228.5(c)	If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria or site selection set forth in Section 228.5 through 228.6, the use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.		
228.5(d)	The sizes of ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation, site study.		
228.5(e)	USEPA will, wherever feasible, designate ocean dumping sites beyond the edge of the Continental shelf and other such sites that have been historically used.		
228.6(a)(1)	Geographical position, depth of water, bottom topography and distance from coast;		
228.6(a)(2)	Location in relation to breeding, spawning, nursery, feeding or passage areas of living resources in adult or juvenile phases;		
228.6(a)(3)	Location in relation to beaches and other amenity areas;		
228.6(a)(4)	Types and quantities of wastes (dredged material) proposed to be disposed of, and proposed methods of release, including methods of packaging the waste (dredged material), if any;		
228.6(a)(5)	Feasibility of surveillance and monitoring;		
228.6(a)(6)	Dispersal, horizontal transport and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any;		
228.6(a)(7)	Existence and effects of current and previous discharges and dumping in the area (including cumulative effects);		
228.6(a)(8)	Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the ocean;		
228.6(a)(9)	The existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys;		
228.6(a)(10)	Potentiality for development or recruitment of nuisance species in the disposal site;		
228.6(a)(11)	Existence at or in close proximity to the site of any significant natural or cultural features of historical importance.		

Table 2. Ocean dumping reference table for the Western and Central LIS Disposal Site Designation EIS.

Kay Words and Phrasas	LIS Evaluation Factors	Screening
The state of the s		Tier
Holli 40 CFR 228	(USELA dud USACE 1999)	Tici
a-e): General Considerations for the Selec	ction of Sites	
Perturbations to the environment during	Disposal Site Feasibility and Stability	1
initial mixing		
Designating historically used sites	Disposal Sites	1
Interference with other activities:	Navigation considerations	1
avoiding areas of existing fisheries or		1
	Commercial and Recreation Fisheries	
•		1
Limiting site size for monitoring and	Accessibility	2
closure of interim ODMDSs	N/A	N/A
\(\lambda \) \(\la		
		1
amenities	N/A	1
Site dispersion, transport, and mixing	Disposal Mound Height Limit	1
characteristics	Disposal Site Feasibility and Stability	1
	Duration of Potential Adverse Impacts	2
	Site Characteristics	2
Interference with other uses	Site Use Conflicts	1
	Conservation Areas	1
	Economic Impacts	2
Geography, depth, topography, distance	State Waters/Basins	1
from coast	Site Characteristics	2
Location relative to living resources:	Endangered Species	2
	Existing Habitat(s) at Site	2
		2
	Essential Fish Habitats	2
Types and quantities of wastes and disposal methods	Capacity and Area of Impact	2
*	Cultural/Archaeological Pasource Sites	2
1 Toximity to instorted reatures		
		2
	Economic impacts	2
	Perturbations to the environment during initial mixing Designating historically used sites Interference with other activities: avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation Limiting site size for monitoring and surveillance closure of interim ODMDSs a)(1-11): Specific Considerations for Site Location relative to beaches and amenities Site dispersion, transport, and mixing characteristics Interference with other uses Geography, depth, topography, distance from coast Location relative to living resources: breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases Existing water quality and ecology of site	rfrom 40 CFR 228 General Considerations for the Selection of Sites Perturbations to the environment during initial mixing Designating historically used sites Interference with other activities: avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation Limiting site size for monitoring and surveillance closure of interim ODMDSs N/A A)(1-11): Specific Considerations for Site Selection Location relative to beaches and amenities Site dispersion, transport, and mixing characteristics Interference with other uses Interference with other uses Geography, depth, topography, distance from coast Location relative to living resources: breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases Existing Water quality and ecology of site Types and quantities of wastes and disposal methods Cisposal Site Feasibility and Stability Disposal Mound Height Limit Disposal Site Feasibility and Stability Duration of Potential Adverse Impacts Site Characteristics Site Use Conflicts Conservation Areas Economic Impacts State Waters/Basins Site Characteristics Endangered Species Existing Habitat(s) at Site Recreational Uses Essential Fish Habitats Capacity and Area of Impact

Appendix A: Presentation - Introduction

(Jeannie Brochi, USEPA)

Agenda

10:00 pm Welcome/Logistics/Objectives

Jean Brochi, EPA Region 1

10:15 pm ELIS ZSF/Site Screening

Lynne McLeod/Carlton Hunt, Battelle

11:15 pm Discussion

12:00 pm Lunch Break

12:30 pm Physical Oceanography

Jim O'Donnell, UCONN

2:30 pm Discussion

3:00 pm Wrap Up/Next Steps, Adjourn

Cooperating Agency Meeting (#1)

Eastern Long Island Sound Supplemental Environmental Impact Statement (ELIS SEIS)



U.S. EPA Region 1 January 8, 2013

- July 2012 EPA requested agencies and tribes to participate as cooperating agencies.
- Cooperating Agency Status:
 - to ensure that all Federal agencies are actively considering designation of Federal and nonfederal cooperating agencies in the preparation of analyses and documentation required by the National Environmental Policy Act (NEPA) participation.

ELIS SEIS PROCESS

- Agency representatives have responded from the following State agencies (CT, NY, and RI); Federal agencies (Corps NYD, Corps NED, USFWS, NMFS, Navy).
- EPA will continue to work with Tribes and other agencies.
- This is the first of several Cooperating Agency Meetings throughout this process.
- Cooperating Agency status does not interfere with agency representatives regulatory responsibilities.

NOTICE OF INTENT

SCOPING

ZONE OF SITING FEASIBILITY (ZSF)

IDENTIFICATION OF ALTERNATIVES AND DATA NEEDS FOR EXISTING SITES

NEW SITES

SCREENING PHASE I / PHASE II

SELECT CANDIDATE SITES

EXISTING SITES

ASSESS DATA NEEDS

COLLECT DATA

PREPARE DRAFT EIS

COMMENT PERIOD

PREPARE FINAL EIS

COMMENT PERIOD



EPA website revised: http://www.epa.gov/region1/eco/lisdreg/elis.html

Email notification system, contact: **ELIS@epa.gov** if you would like to be added to the email distribution list.

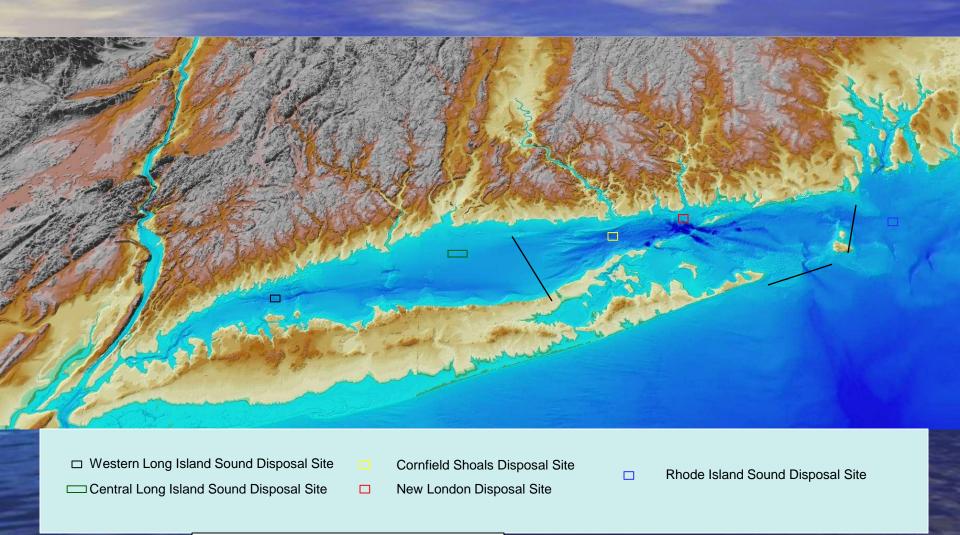
Objectives:

- Cooperating Agencies have until January 18, 2013 to comment on ZSF and site screening.
- EPA would like Cooperating Agencies input on the following:
- ZSF, areas to focus field work, Phys O. sample design, data gaps.
- Do agencies have additional data?

LIS DMMP ZSF:

Western boundary at the Throgs Neck Bridge.

Eastern boundary is a line from Point Judith to Block Island to Montauk Point and then following the spine of the south fork moraine west to include all the waters of Gardner's Bay, Peconic Bay.



- July 2012 EPA requested agencies and tribes to participate as cooperating agencies.
- Cooperating Agency Status:
 - to ensure that all Federal agencies are actively considering designation of Federal and nonfederal cooperating agencies in the preparation of analyses and documentation required by the National Environmental Policy Act (NEPA) participation.



Existing Data:

- Data collection for original LIS EIS included eastern LIS from 1999-2002.
- EPA conducted site monitoring surveys on OSV Bold in 2007, and 2009 2012.
- **USACE DAMOS Monitoring:**

NLDS – 10 surveys since 1990: bathy, physical oceanography, benthic biology, chemistry

CSDS – 3 surveys since 1990: bathy, sediment transport

RISDS – 4 surveys since 2000: bathy, benthic biology, lobster abundance, plume tracking



Dredging Needs Report completed in October 2009:

Determined that approximately 13.5 million cubic yards will be dredged from ELIS harbors and channels over the next 26 years (planning horizon to 2028)

Upland, Beneficial Use, and Sediment Dewatering Reports completed in 2009-2010:

Determined that there are very few alternatives to openwater disposal sites in CT, and most of those are beach nourishment

Next Steps

- Additional public meetings in 2013
- Draft SEIS by December 2014
- Final SEIS by December 2015
- If SEIS recommends designation of one or more sites, publish final rulemaking by December 2016

Questions?



Appendix B: Presentation - Zone of Siting Feasibility and Preliminary Site Screening

(Lynn McLeod, Battelle)



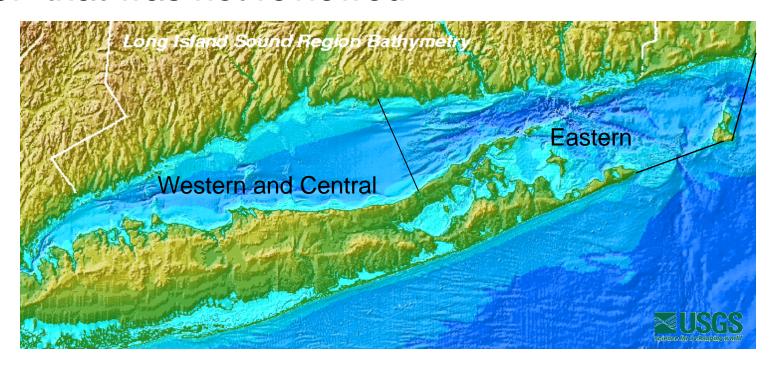
Eastern Long Island Sound Supplemental EIS (SEIS) Preliminary Zone of Siting Feasibility and GIS Screening for Candidate Alternative Dredged Material Disposal Sites

Interagency Meeting at CTDOT January 8, 2013



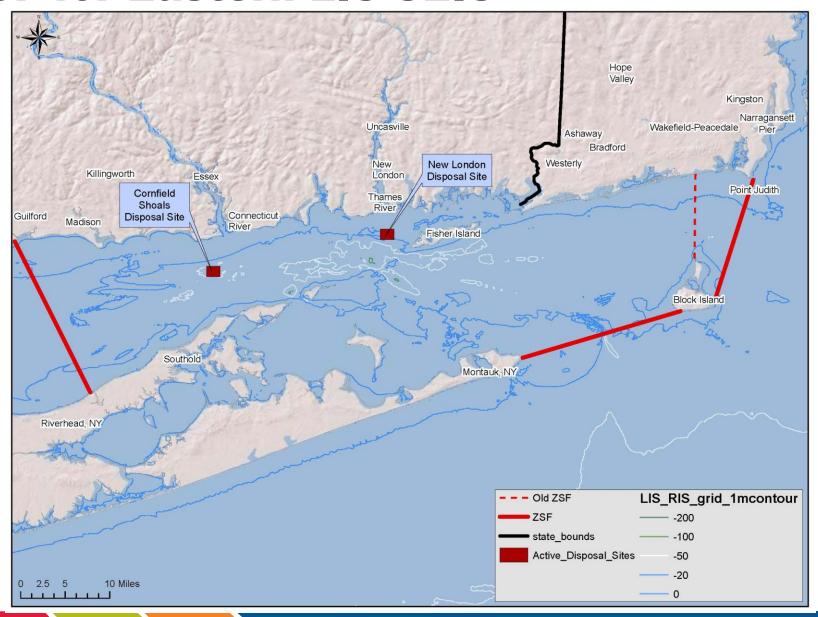
Zone of Siting Feasibility

- The SEIS will address the eastern region of LIS which was deferred during the earlier review of the western and central regions.
- It focuses on the remaining portion of the original ZSF that was not reviewed.





ZSF for Eastern LIS SEIS





Objectives of the Screening

- To identify <u>areas</u> within the revised ZSF acceptable for locating an open water disposal site designated under the Ocean Dumping Regulations
- To identify <u>specific alternative disposal site(s)</u>
 within the acceptable area(s) for further evaluation in the SEIS



Approach to Screening

- General Approach
 - Review Marine Protection, Research, and Sanctuaries Act of 1972 Criteria
 - 5 general (40 CFR 228.5) and 11 specific regulatory criteria (40 CFR 228.6) for ocean dredged material site designation.
 - Map previously defined LIS alternative dredged material site evaluation factors onto the ocean dumping regulation criteria
 - Prioritize the LIS factors into Tier 1 and Tier 2 screening levels
 - Tier 1 rule out areas not acceptable for an open water disposal site
 - Tier 2 identify specific locations for alternative site(s)

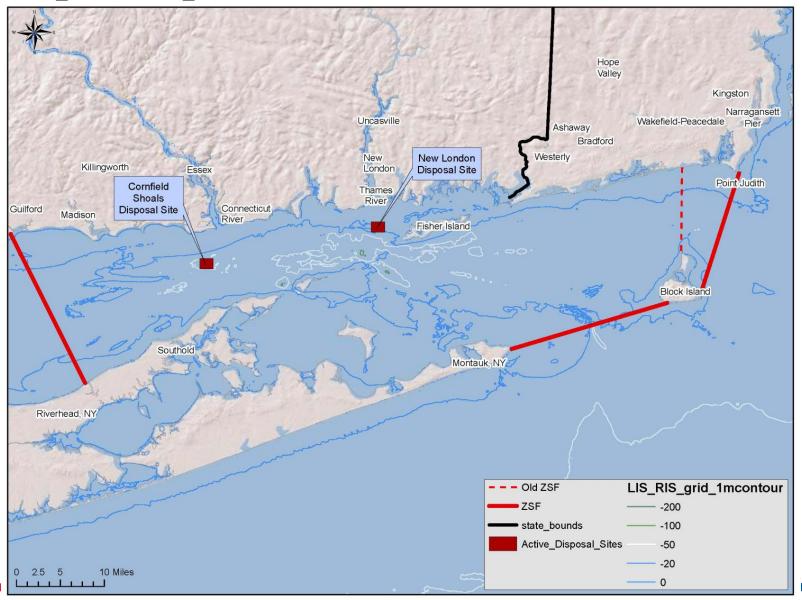


Approach to Screening

- Tier 1: Rule out areas based on the following
 - Sediment Stability/Instability 228.5(b)
 - Bathymetry/Currents and Waves
 - Sediment Stability (e.g., Sheer Stress, Sediment Texture)
 - Data for this screening will be investigated as part of the physical oceanography work conducted by UCONN as part of this project
 - Disposal Feasibility 228.5(b)
 - Water Quality Perturbations and Near Term Fate (i.e., STFATE)
 - Data for this screening will be investigated as part of the physical oceanography work conducted by UCONN as part of this project

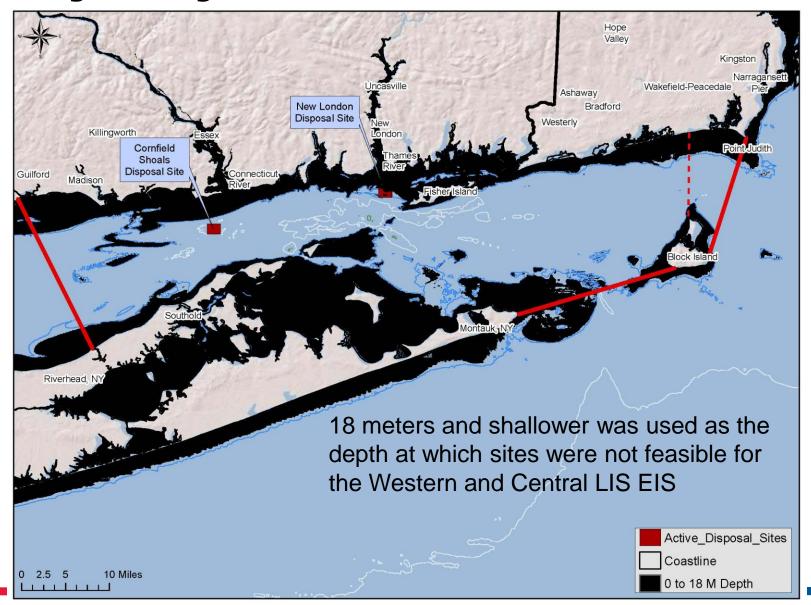


Sediment Stability/Instability - Bathymetry





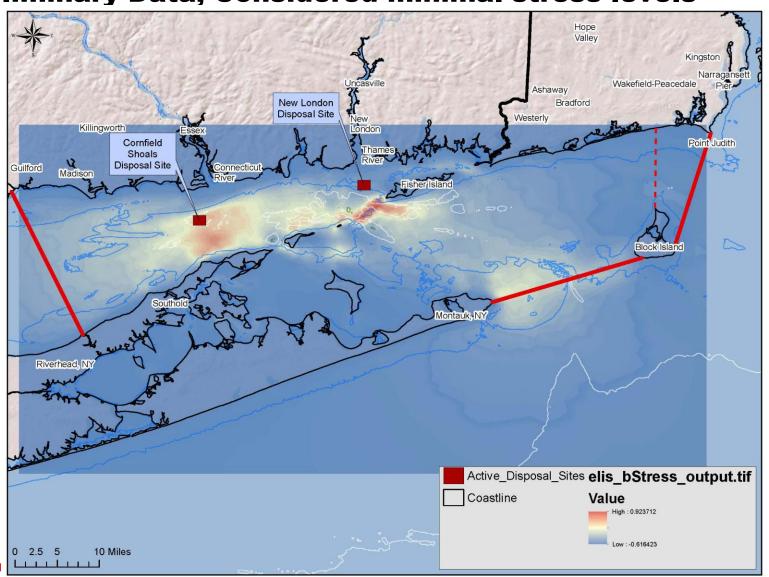
Sediment Stability/Instability - Bathymetry





Sediment Stability/Instability- Tidal Driven Bottom Stresses

Preliminary Data; Considered minimal stress levels





Approach to Screening

- Tier 1: Rule out areas based on the following
 - Sediment Stability/Instability 228.5(b)
 - Bathymetry/Currents and Waves
 - Sediment Stability (i.e., Sheer Stress, Sediment Texture)
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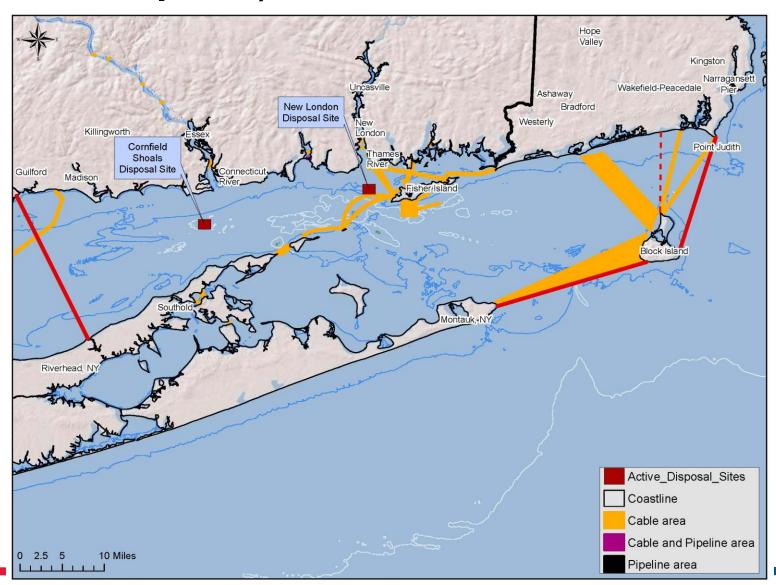
Approach to Screening

- Tier 1: Rule out areas based on the following
 - Areas with conflicting uses 228.6(a)(8)
 - Beaches and amenities 228.6(a)(3)
 - Utilities (pipelines, cable areas, etc)
 - Conservation areas (sanctuaries, wildlife refuges, national seashores, parks, fish havens, artificial reefs)
 - Shellfish and Fishing areas 228.5(a)
 - Interference with Navigation 228.5(a); 228.6(a)(8)
 - Submarines, Coast Guard vessels, large tankers, fishermen, etc.

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Areas with Conflicting Uses – Cables and Pipelines

(Needs to be Updated)



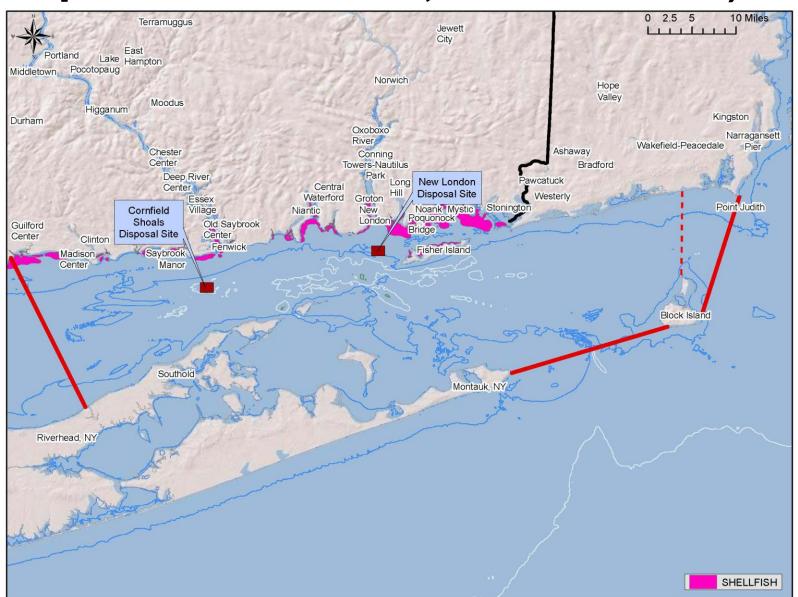


Approach to Screening

- Tier 1: Rule out areas based on the following
 - Areas with conflicting uses -228.6(a)(8)
 - Beaches and amenities 228.6(a)(3)
 - Utilities (pipelines, cable areas, etc)
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 - Interference with Navigation 228.5(a); 228.6(a)(8)
 - Submarines, Coast Guard vessels, large tankers, fishermen, etc.

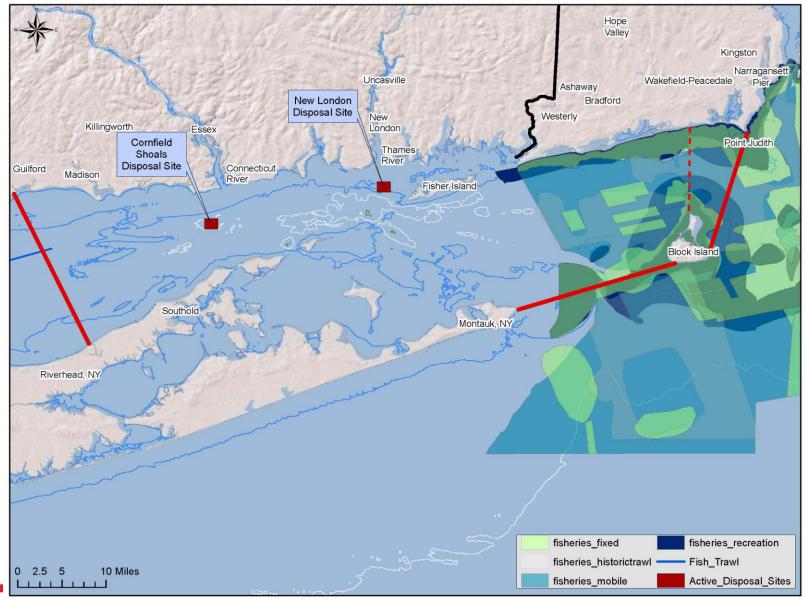


Shellfish Bed Locations - (CT updated from CTDEEP, NY Data needed)





Fishing Areas (RI updated; CT & NY Data needed)



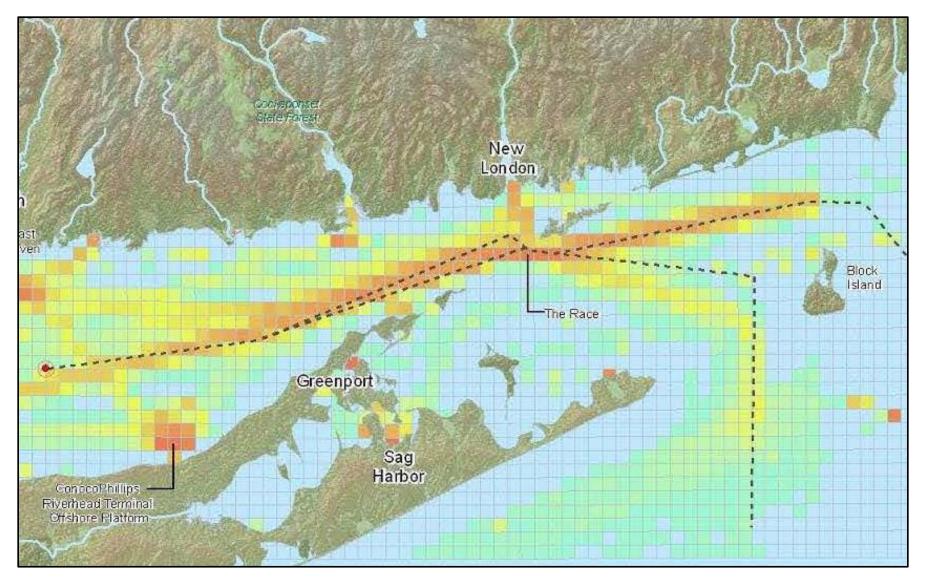


Approach to Screening

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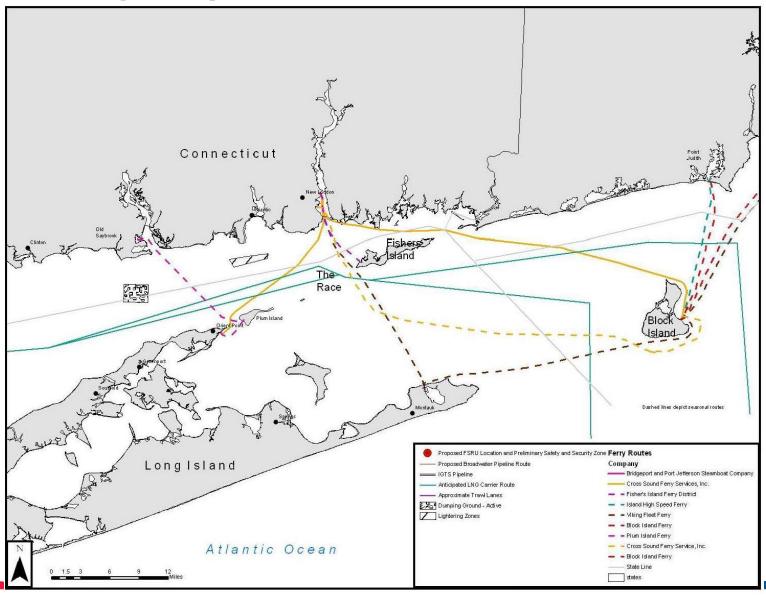


Ship Traffic Density (USCG Figure)





Commercial Vessel Navigation (USCG Figure)



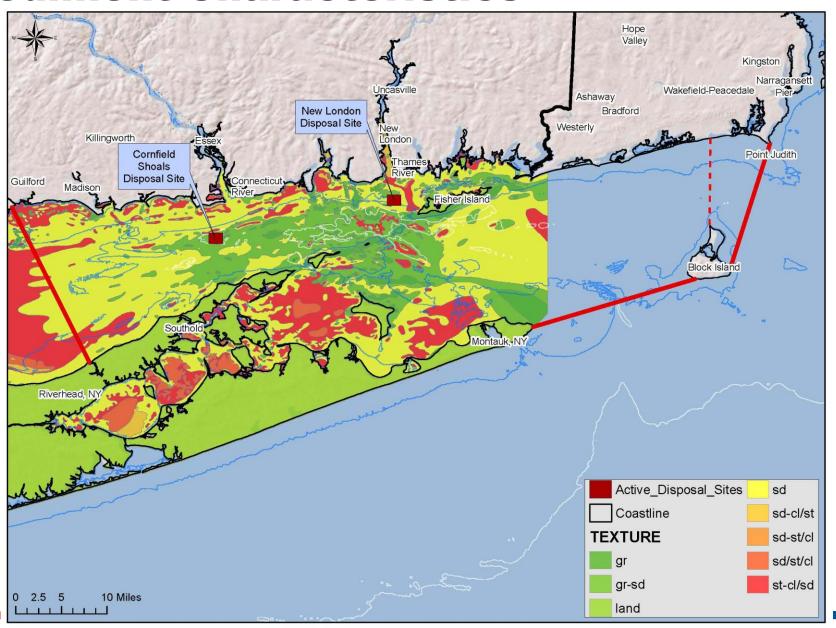


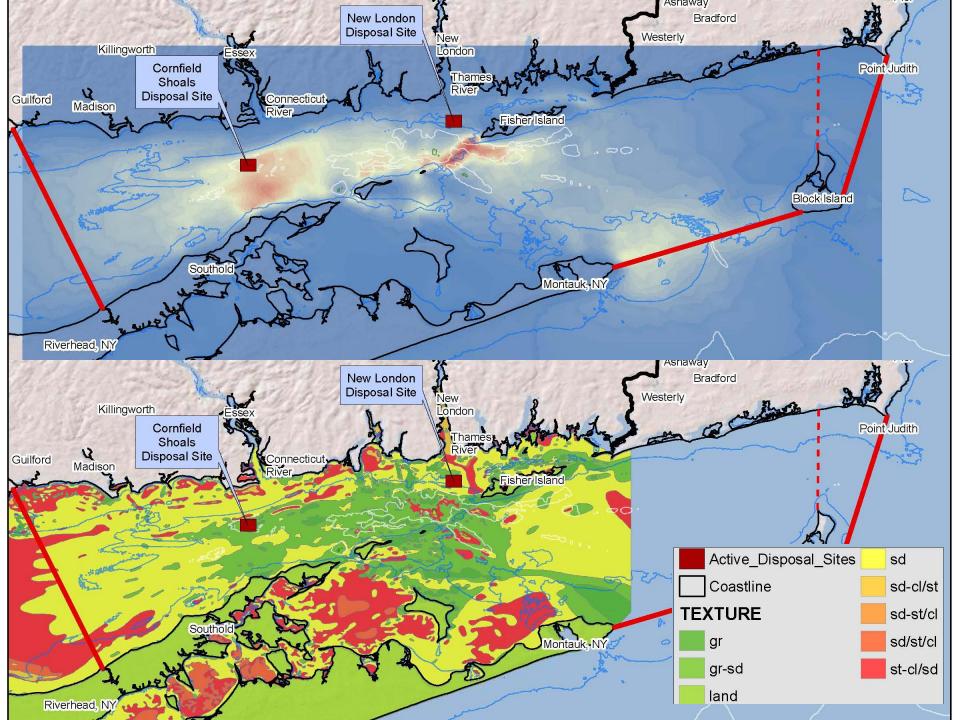
Approach to Screening

- Tier 1: Rule out areas based on the following
 - Valuable marine habitats 228.5(a)
 - Gravel and hardbottom areas were identified previously as important to maintain, are these still applicable?
 - Areas of high dispersion potential 228.6(a)(6)
 - Last time only containment sites were warranted. What type(s) of dredged material disposal site(s) are needed?
 - Containment All materials remain at the location where they are placed
 - Dispersive Materials are allowed to be moved off of the placement location through currents, etc.



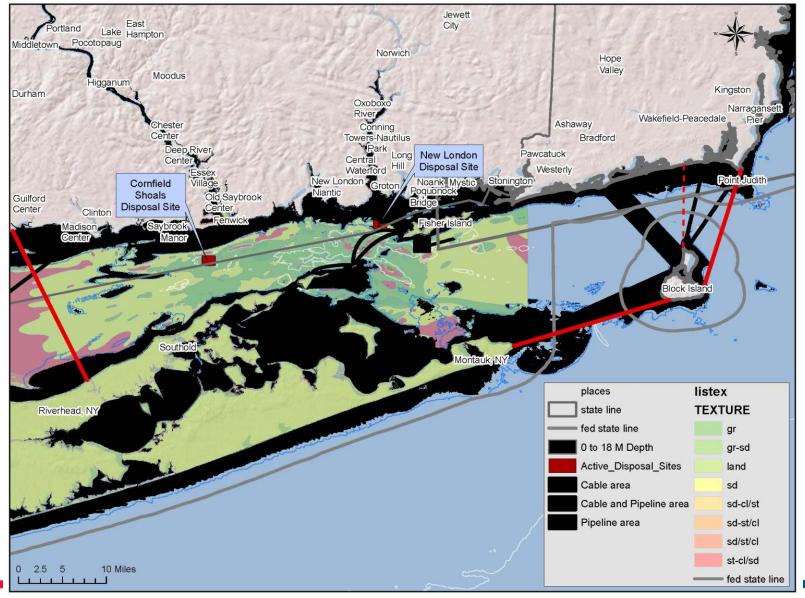
Sediment Characteristics







Approach to Screening Tier 1 Type Screening Results



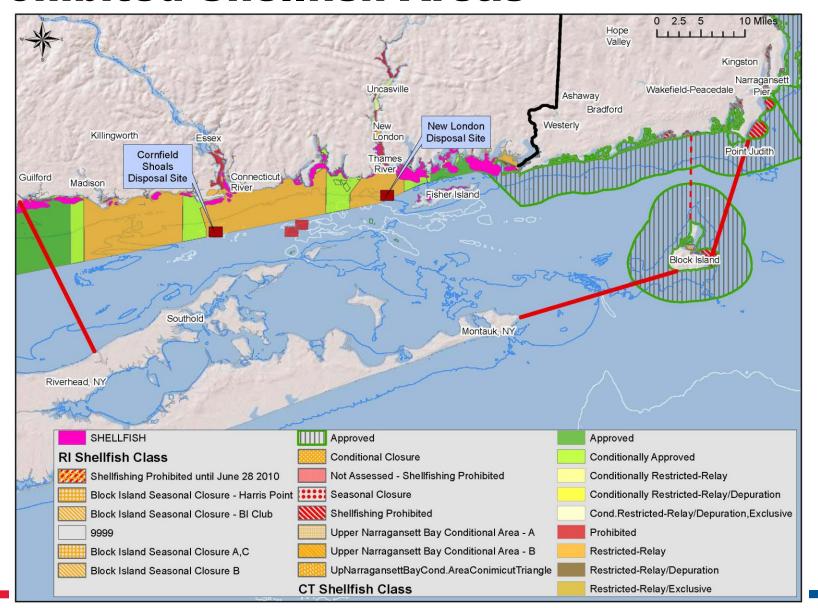
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Approach to Screening

- Tier 2: Identify specific alternative site locations
 - Minimizing impact to
 - Archeological resources 228.6(a)(11)
 - Fish habitats, fish concentrations 228.5(a); 228.6(a)(8)
 - Living resources (breeding, spawning, nursery, feeding, passage) –
 228.6(a)(2)
 - Benthic community 228.6(a)(9)
 - Shellfisheries/fisheries resource areas 228.6(a)(8)
 - Historic Disposal Sites and Continental Shelf 228.5(e)
 - Preferred siting of areas were also based on a series of site characteristics (e.g., prevailing current direction and velocity, compatible sediment types) 228.5(d); 228.6(a)(5); 228.6(a)(6)

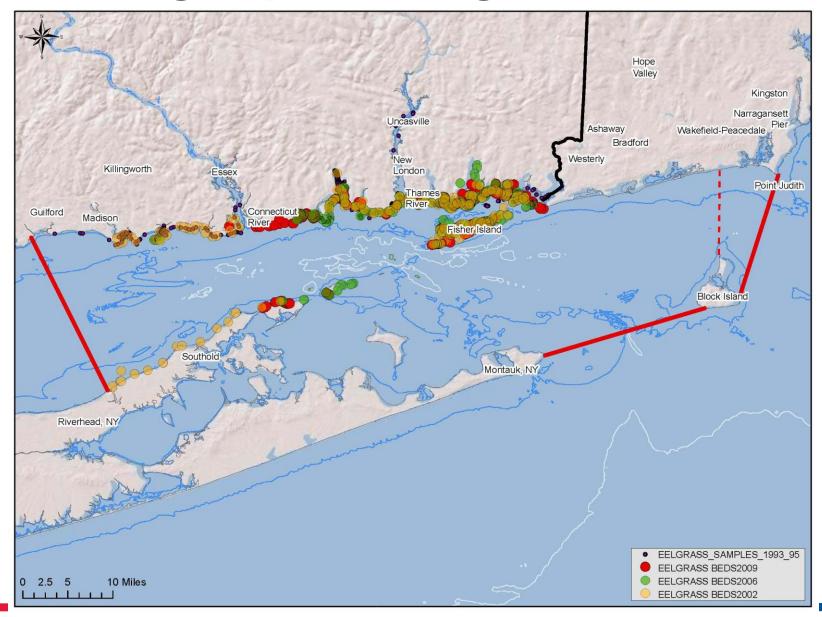


Minimizing Impact – Approved/ Prohibited Shellfish Areas





Minimizing Impact - Eelgrass Beds



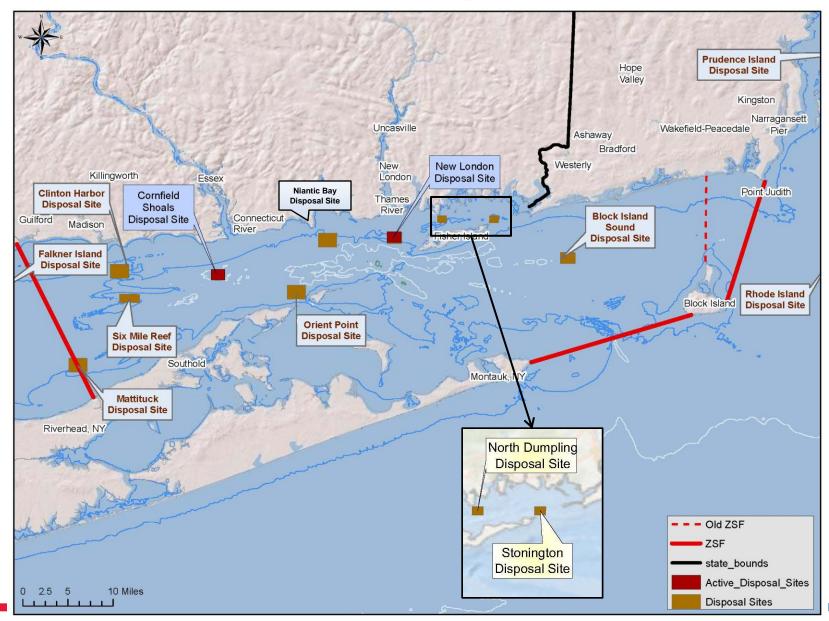
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Approach to Screening

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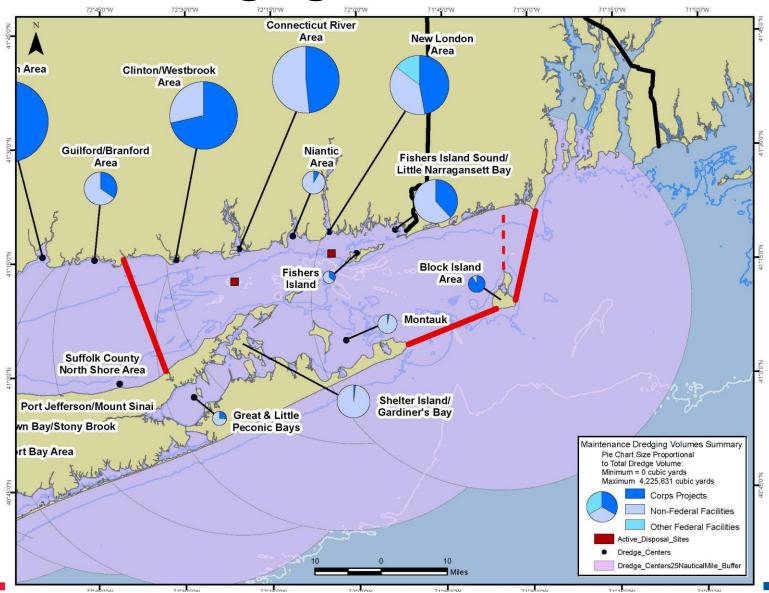


Historic and Active Disposal Sites





Continental Shelf and Areas within 25 nm of Dredging Centers



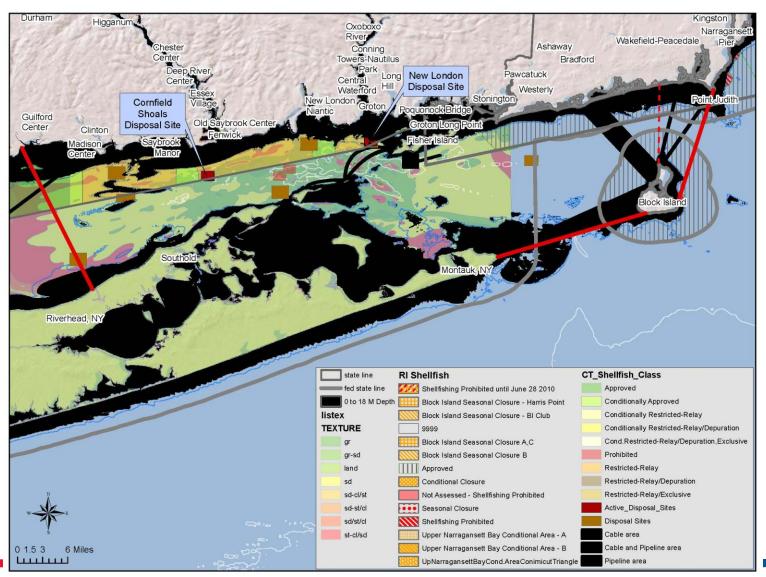
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Approach to Screening

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Approach to Screening Tier 2: Preliminary Screening Results for Discussion Only





Tier 2 Alternative Site

- Several factors must be considering when assessing an area as an alternative site.
 - Site Boundaries 228.5(d), 228.6(a)(4), 228.6(a)(5)
 - Buffer Zones 228.5(b), 228.6(a)(6)
 - Reference areas for monitoring and testing 228.6(a)(5)



Tier 2 Alternative Site(s)

- Factors to be discussed in the SEIS
 - Once alternative site(s) are selected
 - Tier 1 criteria will be addressed as appropriate in SEIS
 - Tier 2 criteria will be examined in detail in the SEIS
 - Additional SEIS siting considerations will include:
 - Existing water quality 228.6(a)(9)
 - Nuisance Species 228.6(a)(10)
 - Economic impacts 228.6(a)(8)
 - Site protection requirements Environmental consequences
 - 228.10 Evaluating disposal site impacts



Next Steps

- Finalized criteria that will be used to conduct the screening
 - Minimum depth
 - Bottom types to avoid
 - Containment, Dispersive, or Both
 - Site Protection Requirements
- Identify and acquire more recent or available data to use in the screening
- Identify data gaps and conduct studies to fill them
 - Sediment Stability/Instability
 - STFATE Modeling
 - Minimum Shear stress verification

Appendix C: Presentation - Physical Oceanography Study (James O'Donnell, UConn)



Recent Physical Oceanography Data Update and Observation and Model Plans

James O'Donnell
University of Connecticut

Overview



- 1. Introduction
- 2. Bottom Stress and circulation are central to the site designation process.
 - a) Consideration of all possible sites is only possible if models are used to "interpolate" between the limited location and times data is available.
 - b) A well tested model requires data for evaluation.
- Summary of the data required to predict the range of circulation and bottom stresses expected throughout the ZSF.
- 4. Summary of data available
- 5. Observation Plan
- 6. Modeling plans

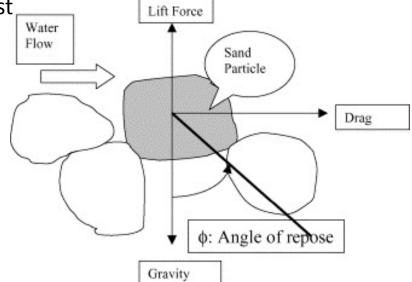
Physics of Sediment Transport

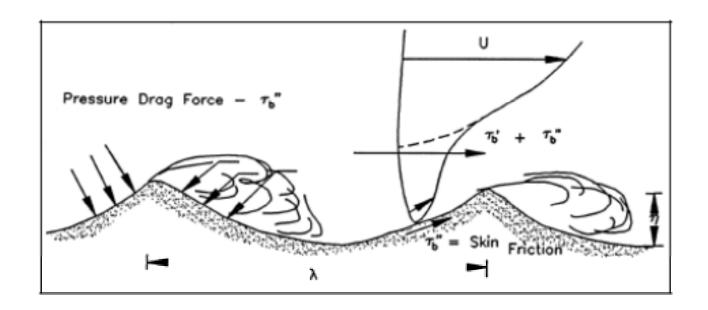
For sediment resuspension the lift force due to the flow around it must exceed the gravity force.

UCONN

The lift and drag forces slow the water and this effective force per unit area is called the shear stress.

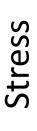
Bedforms have a similar effect on the flow... they slow it down.





Shields Curve





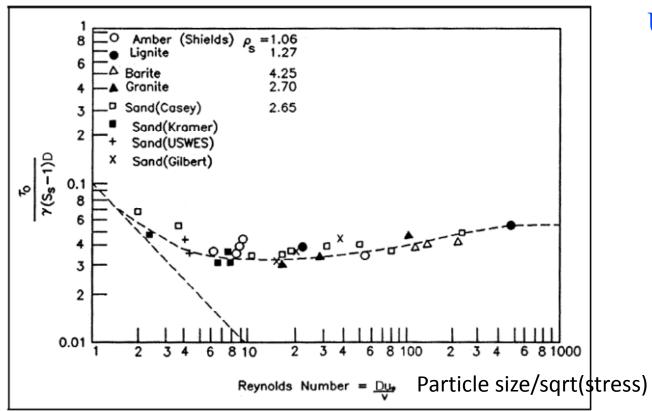


Figure III-6-7. Shields diagram for initiation of motion in steady turbulent flow (from Raudkivi (1967))

More simply

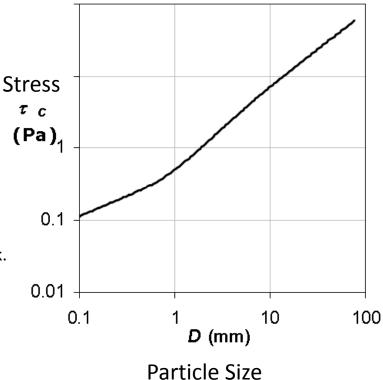


$$S^* = \frac{\sqrt{(s-1)gD^3}}{\mu/\rho}$$
 and $s = \frac{\rho_s}{\rho}$ (2.65±5%)

The trend on the diagram can be represented by the function

$$\tau_c^* = 0.105(S^*)^{-0.3} + 0.045 \exp\left[-35(S^*)^{-0.59}\right]$$

From: Peter Wilcock, UC Berkeley http://calm.geo.berkeley.edu/geomorph//wilcock/wilcock.html



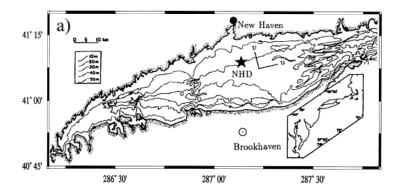
Storm Enhanced Bottom Shear Stress and Associated Sediment Entrainment in a Moderate Energetic Estuary

YuHuai Wang*, W. Frank Bohlen and James O'Donnell

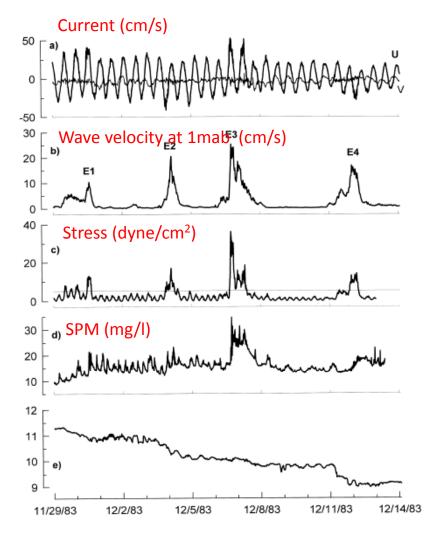
Department of Marine Sciences, University of Connecticut, Groton, CT 06340, U.S.A.

(Received 3 April 1999; in revised form 1 September 1999; accepted 11 October 1999)

Several important mechanisms for storm-induced entrainment of estuarine cohe sediments are analyzed using field measurements collected in a moderately energestuary, central Long Island Sound, U.S.A. The sediment concentration hydrographic data were obtained by an array of sensors mounted at 1 m above bottom. The bottom sediment in the study site composed mostly of silt and silty some that the bottom shear stress, computed using a wave-current in action model, increased significantly during the episodic wind events. A laresuspension event was triggered by a frontal passage when strong wind-driven rents augmented the tidal currents. The timing of storm waves with respect to tidal phase also was a critical factor. Based on the changes of suspended sedin concentration, the bottom appeared to respond to the shear stress in two phases: tidal resuspension and the storm-induced erosion. During each tidal cycle, entr ment was associated with resuspension of high water content, loosely consolidated material. During episodic events, a thin layer of more consolidated bed below sediment-water interface was eroded by the enhanced bottom stress.







2. Summary of data needs – controlling factors.

- Current in the ZSF controlled by tides, density variations and winds.
- 2. Bottom stress if determined by current and waves.
- 3. Waves are generated by wind.
- 4. We want to know the circulation and stress during normal conditions (for each season) and for extreme conditions.
- 5. We can only observe them all for selected interval and at a few places so we need a model to generalize the observations.

3. What is available?



• Three great resources:

- 1. Woods Hole Group (2011). Long Island Sound Dredged Material Management Plan (DMMP) Phase 2 Literature Review Update June 2010, Prepared for U.S. Army Corp of Engineers, Contract No. W912WJ-09-D-0001-TO-0022
- 2. O'Donnell, J., R. E. Wilson, K. Lwiza, M. Whitney, W. F. Bohlen, D. Codiga, T. Fake, D. Fribance, M. Bowman, and J. Varekamp (2013). The Physical Oceanography of Long Island Sound. In Long Island Sound: Prospects for the Urban Sea. Latimer, J.S., Tedesco, M., Swanson, R.L., Yarish, C., Stacey, P., Garza, C. (Eds.), 2013 (Elsievier, In press).
- Codiga, D. L. and David S. Ullman (2010). Characterizing the Physical Oceanography of Coastal Waters Off Rhode Island, Part 1: Literature Review, Available Observations, and A Representative Model Simulation (http://seagrant.gso.uri.edu/oceansamp/pdf/appendix/02-PhysOcPart1-OSAMP-CodigaUllman2010.pdf.)

And our Task 2 report

4. Summary of data needs – variables



- Sea level at the edge of the shelf to force tides and the interior of the model domain to check it.
- 2. Wind over the ocean to force the circulation and waves.
- 3. Solar radiation to force temperature variations.
- 4. River discharge measurements to force variations in salinity.
- 5. Salinity and temperature measurements at boundaries to prescribe conditions and in the interior to check predictions.
- 6. Current measurements to evaluate the model predictions
- 7. Wave measurements to evaluate the model predictions
- 8. Bottom stress measurements to evaluate the model prediction







http://tidesandcurrents.noaa.gov/geo.shtml?location=Bridgeport

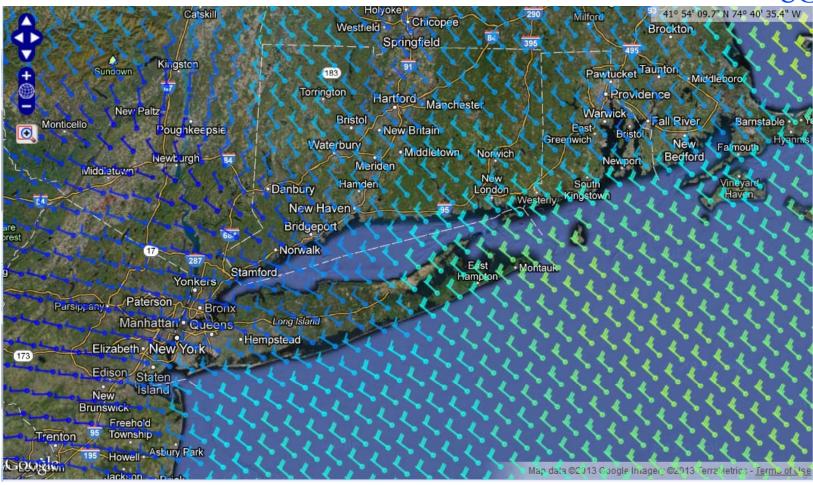
Wind-data



http://www.ndbc.noaa.gov/



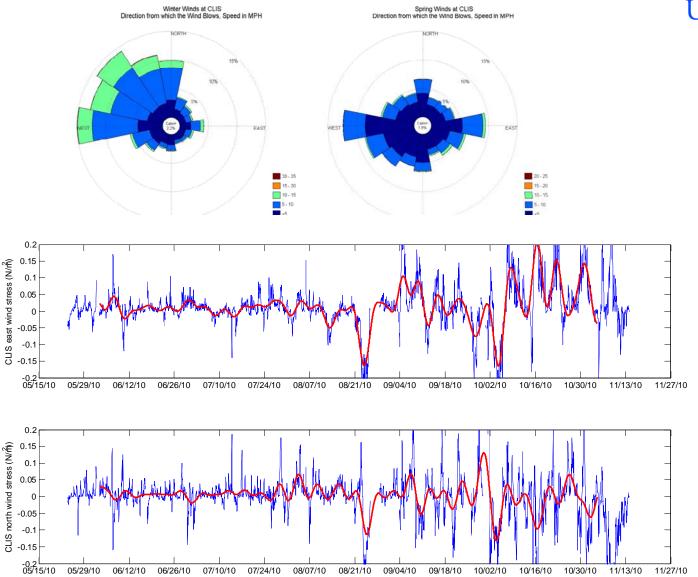




Forecast from http://www.nco.ncep.noaa.gov/pmb/nwprod/analysis/
Viewer: http://maracoos.org

Seasonal variation in Wind





Radiation



DATA



River Discharge (water level)

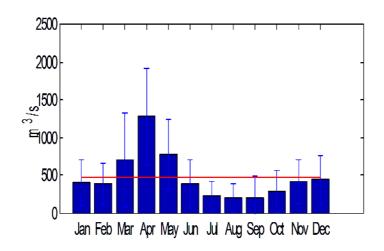


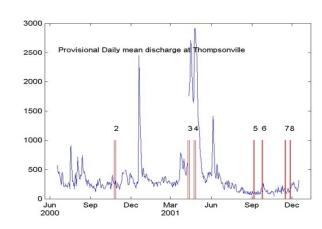


http://maps.waterdata.usgs.gov/mapper/index.html?state=ct

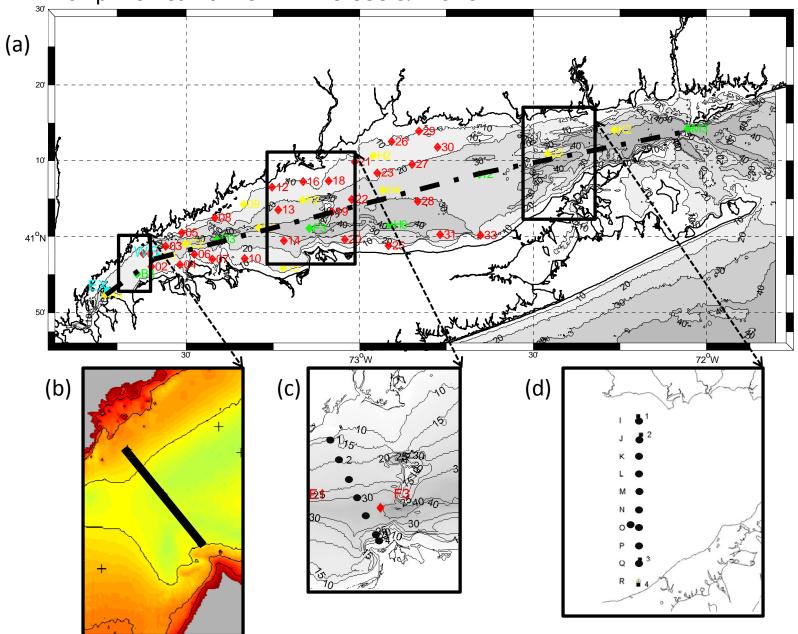
USGS maintains a large network if level/flow gauges. Most freshwater arrives through a few ($^{\sim}10$) source and we will focus effort on these.

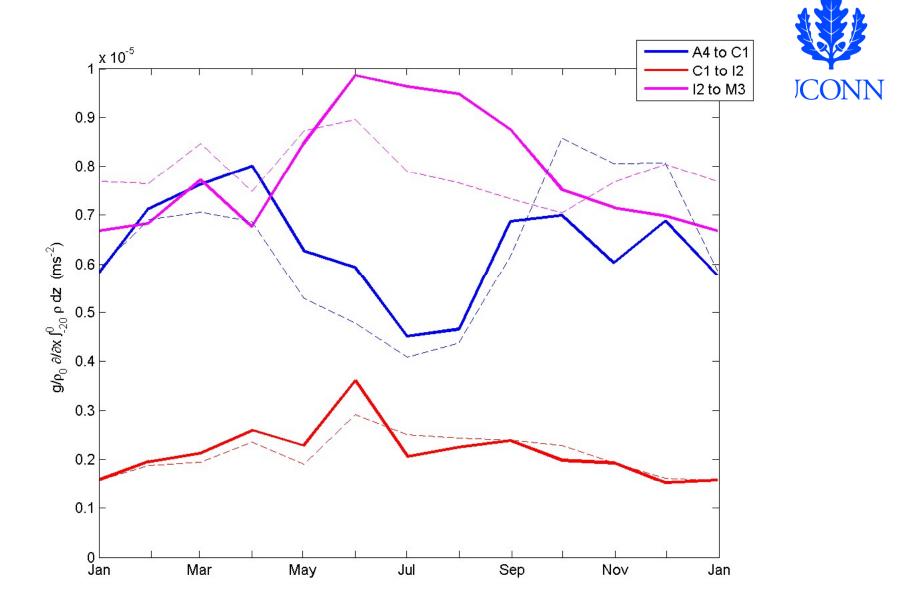
Seasonal Variability in River Discharge





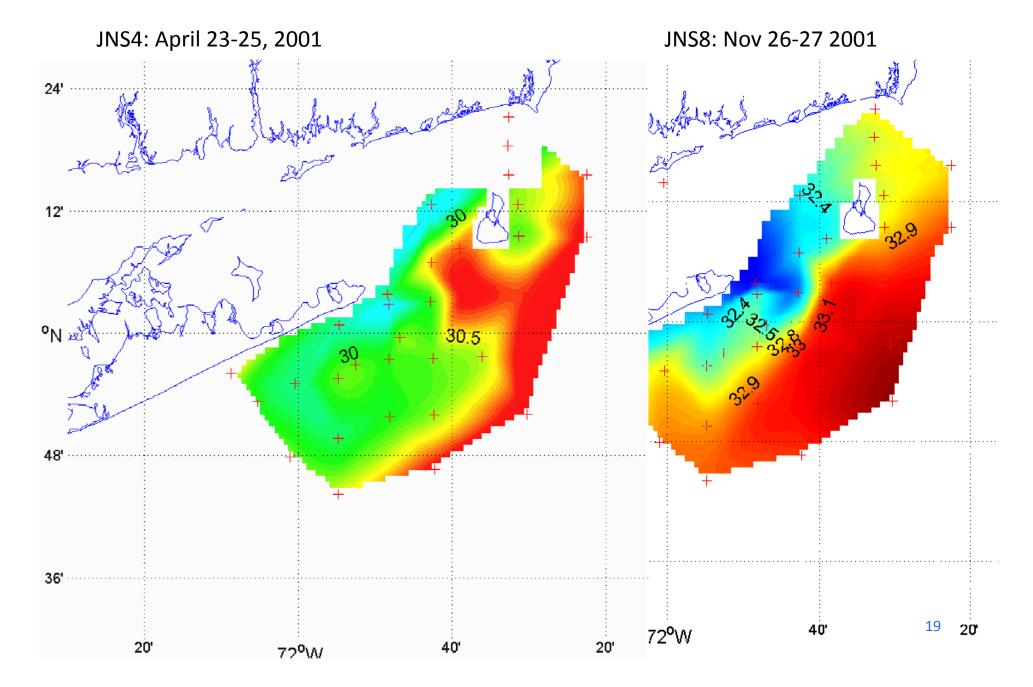
Salinity & temperature -ship Profiles from CTDEP. LISICOS & RESLIS

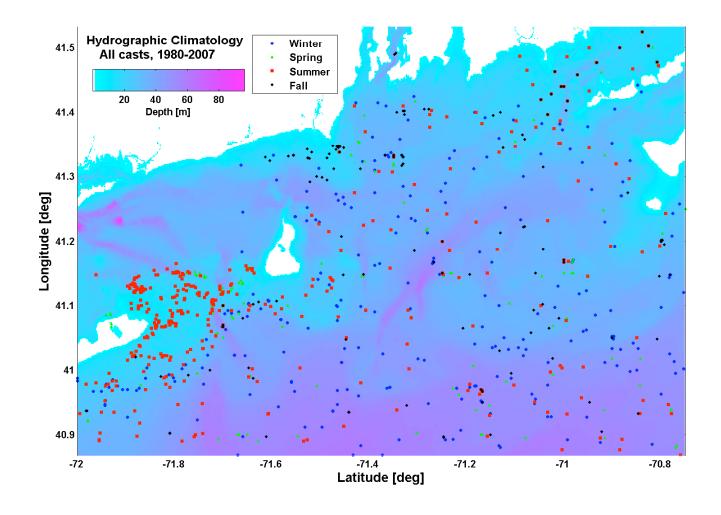


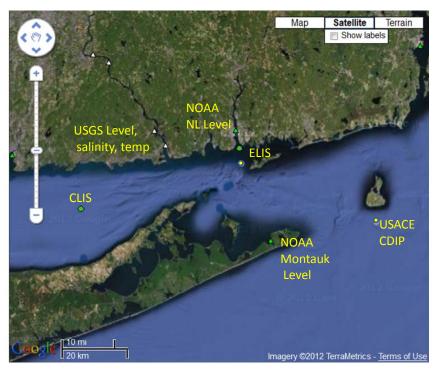


Salinity & temperature Ship Profiles – FRONT program









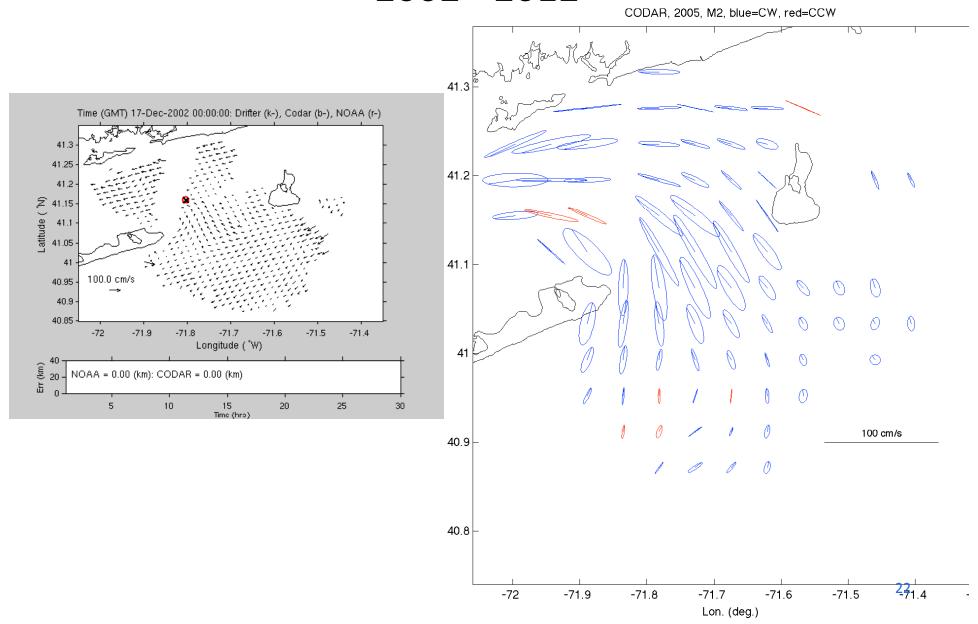
Salinity & temperature, from Buoys.



S-salinity, **T**-temperature, **DO**-dissolved oxygen (membrane sensor), O-dissolved oxygen (optical sensor), CH-chlorophyll (RFU only)

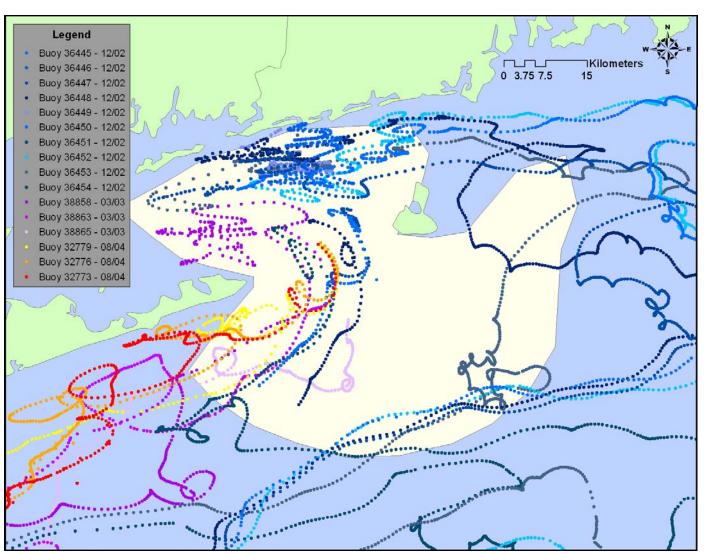
	CLIS Water			ELIS water		
Year	SFC	MID	BTM	SFC	MID	BTM
2012	S,T,CH,O					
2011	S,T,CH,O					
2010	S,T,CH,O			S,T,DO		
2009	S,T,CH,O			S,T,DO		
2008	S,T,DO			S,T,DO		
2007	S,T,DO			S,T,DO		
2006	S,T,DO			S,T,DO		
2005	S,T,DO	S,T,DO	S,T,DO	S,T,DO		S,T,DO
2004	S,T,DO	S,T,DO	S,T,DO	S,T,DO		S,T,DO
2003	S,T,DO	S,T,DO	S,T,DO	S,T,DO		S,T,DO
2002	S,T,DO	S,T,DO	S,T,DO	S,T,DO		S,T,DO
2001				S,T,DO		S,T,DO
2000				S,T,DO		S,T,DO
1999				S,T,DO		

Currents: HF RADAR Vectors in BIS 2002 - 2012



Currents: Lagrangian Drifter Data from BIS



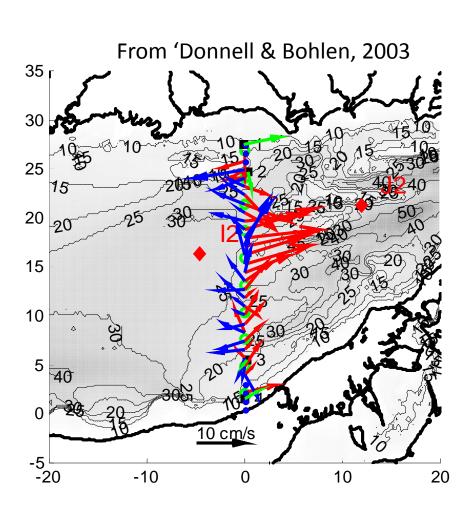


GPS Drifter Tracks
Dec 2002
March 2003
August 2004

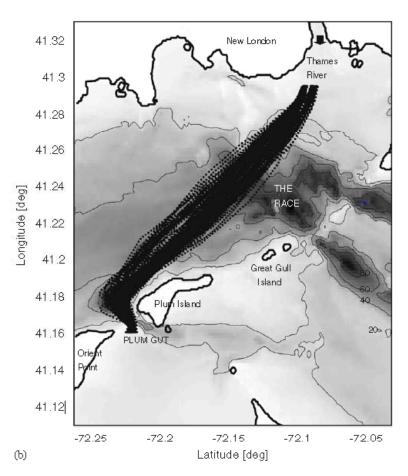
White region represents where CODAR observations are obtained more than 10% of the time

Currents from Ship Surveys: RESLIS and NL-OP Ferrry



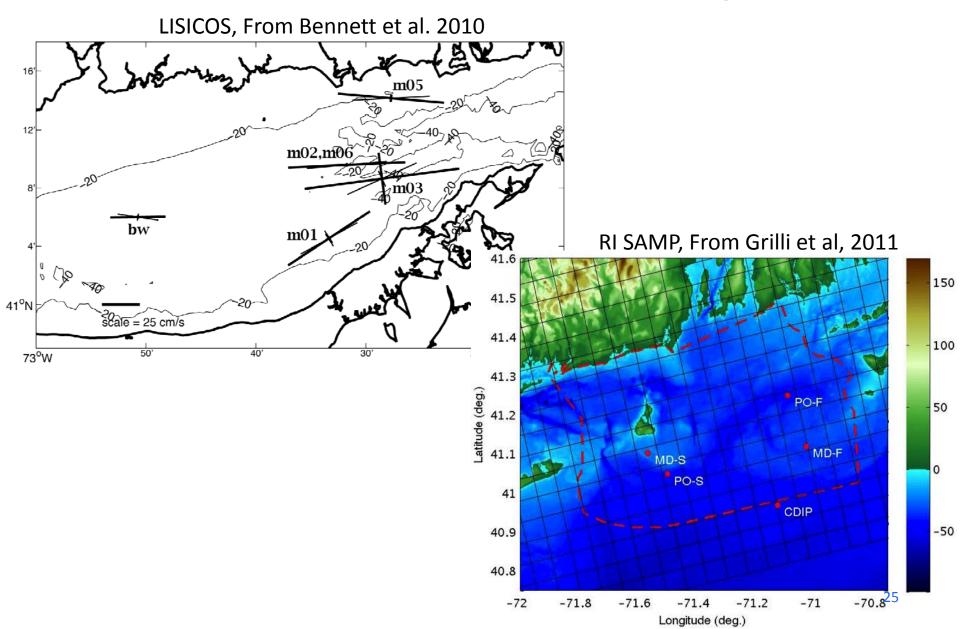


From Codiga & Aurin, (2007)



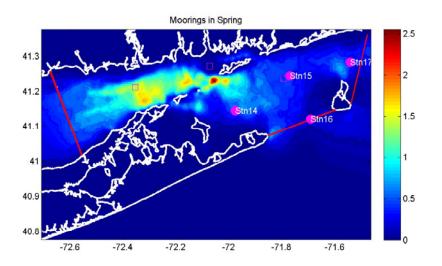
Currents from Moorings

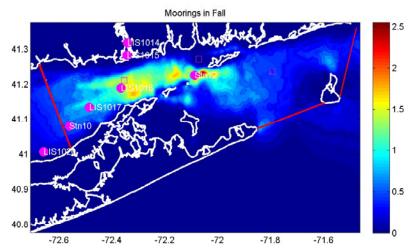


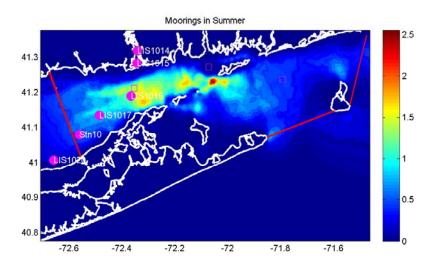


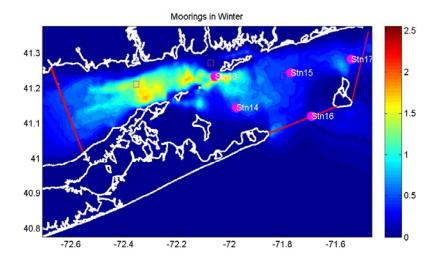
NOAA Current Meters 1988-89 & 2010





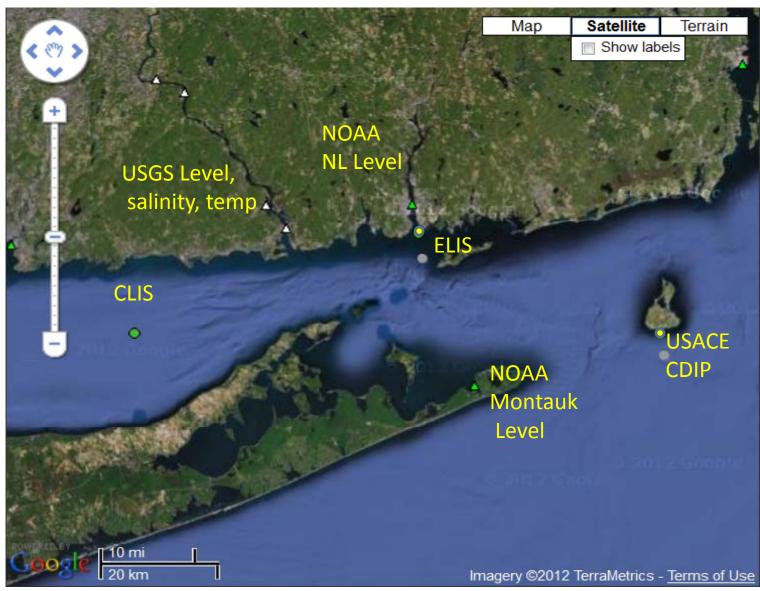






Waves





Bottom Stress – no measurements



Summary



- No Stress
- Waves only at CLIS buoy ZSF
- No North-Sound variation in density in LIS
- No hydrography or current profile measurements in BS-RIS
- Seasonal variations in wind & wave and river discharge are substantial.

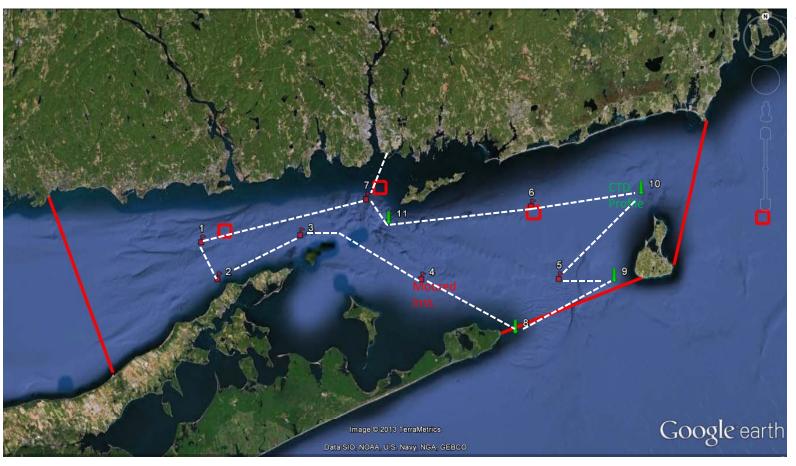
5. Proposal for Observations



- October-March have frequent high winds from NE
- Wind forcing is less in May-Sept
- River Flow is high Mar-May and below average the rest of the year
- Need current, wave and stress measurement in a range of locations in each forcing regime.
 - Windy, low flow (Feb-March)
 - Windy High Flow (April-May)
 - Calm, below average flow (June-July)

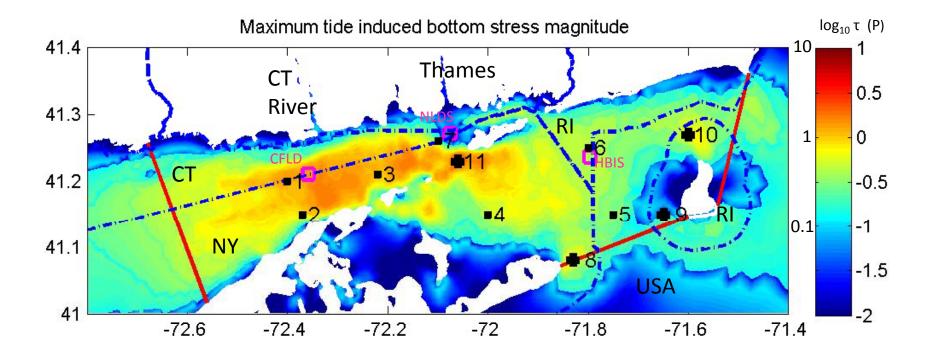
Stations, ZSF and Disposal Sites

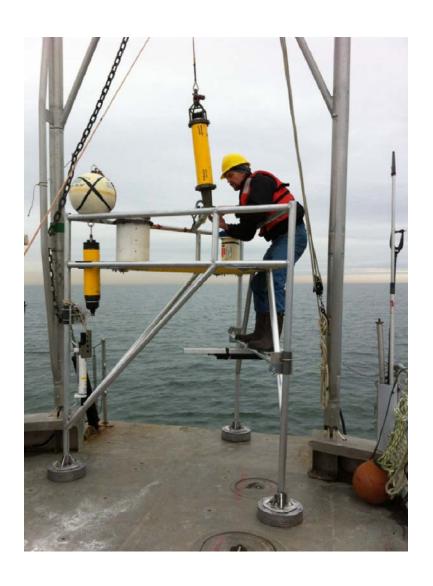




Stations, ZSF and Disposal Sites on preliminary stress estimate UCONN







Bottom Instrumentation

- Upward looking RDI ADCP to measure profile (1-0.5m resolution) of current and wave statistics
- 2. Downward looking Nortek ADCP with 5cm resolution bottom to 75cm to measure stress and acoustic backscatter intensity
- 3. CTD to measure salinity, temperature and bottom pressure
- 4. Optical backscatter at .2 and .8 m to infer SPM concentrations

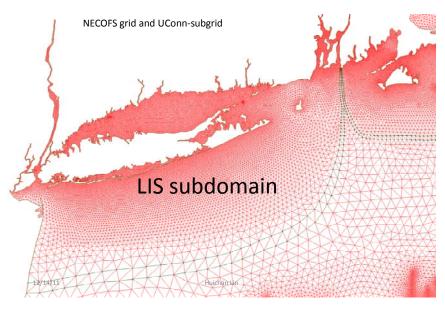


Profiling Instrumentation

- Hull mounted ADCP to surveyCONN current patterns
- 2. CTD to measure salinity, temperature and pressure
- 3. OBS 3+, optical backscatter to infer SPM concentrations
- 4. Water sampler for SPM concentration calibrations
- 5. LISST-100 to measure particle size spectra
- 6. AC9 Optical absorption spectra for discriminating organic and inorganic material

Model - FVCOM





Outer domain simulated by UMass Operationally through NOAA funding

This is a well established code and has been implemented in LIS already.

It is nested inside the UMass Dartmouth Regional Model.

FVCOM will be used to simulate the circulation and wave height and period distributions.

Challenges are to get hydrography variability correct in the ZSF domain and wave model implemented and assessed.



- Use observed winds and river flows to drive model and predict the salinity, temperature, current and waves, and bottom stress.
- Compare to the new and archived observations and evaluate FVCOM performance in LIS.
- Describe the uncertainties.
- Simulate the behavior under extreme events

Analyses

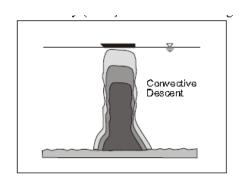


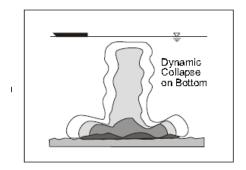
- Observations and model predictions will be used to describe the distributions of current and stress for site screening.
- When sites are being considered there reults will be used to drive the STFATE and LTFATE models.

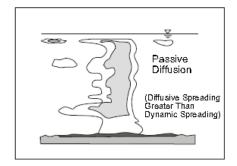
Models STFATE- LTFATE



- STFATE Near field transport during disposal operations
- FVCOM will provide currents, waves and shear for STFATE studies at sites under consideration







LTFATE



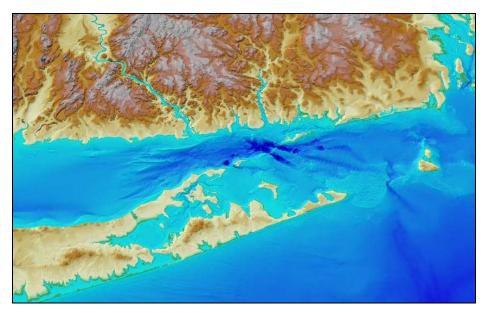
 LTFATE simulates the long term transport of resuspended materials from disposal mound. This requires regional current patterns, and waves forecasts from FVCOM. We will simulate the effects of historic events at alternative sites

Appendix A-7

MINUTES OF COOPERATING AGENCY GROUP MEETING 2

Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Sites in Eastern Long Island Sound, Connecticut and New York

Minutes of Cooperating Agency Meeting 2



Prepared for: United States Environmental Protection Agency

Sponsored by: Connecticut Department of Transportation

Prepared by: Louis Berger

with support from

University of Connecticut













Eastern Long Island Sound – Supplemental EIS



Cooperating Meeting 02 – Minutes

TOPIC: Site Screening and Physical Oceanography Study Update

DATE OF MTG: May 20, 2013

LOCATION: Webinar

TIME: 10:00am to 1:30pm

PARTICIPANTS: Cooperating Agencies

• Connecticut Department of Transportation CTDOT): Joe Salvatore

• US Environmental Protection Agency, Region 1: Jeannie Brochi

Mel Cote Alicia Grimaldi

• Conn. Dept. of Energy and Environmental Protection: George Wisker

• US Army Corps of Engineers, New England District: Cathy Rogers

Mark Habel Michael Keegan Steven Wolf Tom Fredette

• US Army Corps of Engineers, New York District: Nancy Brighton

• NOAA/National Marine Fisheries Service: Diane Rusanowsky

• US Environmental Protection Agency, Region 2: Patricia Pechko

• New York State Department of State: Jim Leary

Kari Gathen Jennifer Street Jessica Leary

• New York State Dept. of Environmental Conservation: Charles de Quillfeldt

University of Connecticut (UConn) Project Team (under contract to CTDOT)

• University of Connecticut: James O'Donnell

Walter Bohlen

• The Louis Berger Group, Inc. (Prepared minutes): Bernward Hay

Amy Atamian

SUBMITTED ON: June 10, 2013

The primary goal of the meeting was to provide (1) an update on the site screening, and (2) an update of the physical oceanographic study, in preparation for the Eastern Long Island Sound (ELIS) Supplemental Environmental Impact Statement (SEIS).

Introduction (Jeannie Brochi, USEPA)

Jeannie Brochi stated that this Cooperating Agency meeting was a follow-up to the first Cooperating Agency meeting, held on January 8, 2013. She further stated that two documents were provided for review and comment by Cooperating Agency members; the documents consisted of the minutes of the first meeting in January, and the report of the first two Public Scoping Meetings.

The objective of this meeting was to identify open water sites to be investigated further as potential disposal sites for dredged material. Ms. Brochi requested input on alternative sites that are being considered. Further, she asked for feedback on data collected so far and for additional relevant information and data that agency members knew about.

Updated Site Screening (Presentation by Bernward Hay, The Louis Berger Group, Inc.)

Bernward Hay noted that this presentation was an extension of the presentation provided by Battelle during the first Cooperating Agency meeting in January. The expanded presentation also included data and information provided by the Rhode Island Coastal Resources Management Council (RICRMC) and the NYSDOS. The presentation consisted of two parts:

- Presentation of screening layers based on an expanded data set
- Discussion of potential alternative sites

Key points of the presentation were as follows (his presentation is attached as Appendix B):

- *Slides 2 and 3 Zone of Siting Feasibility (ZSF):* Consisting of the Eastern Long Island Sound (ELIS) and Block Island Sound (BIS).
- *Tier 1 criteria Sediment stability/instability (Slides 7 to 13):* New information was added from a multibeam survey conducted by the National Oceanographic and Atmospheric Administration (NOAA) and the U.S. Geological Survey (USGS) over the last decade. This information is available for the much of the ELIS, and is currently being processed by the USGS for the BIS. It provides detailed information about the bottom topography of the area. Additional sediment texture information is also available for the entire ZSF from the USGS data base. Areas of high bottom stress (as a result of tidal currents and roughness of the substrate) generally coincide with areas of coarser sediment texture.
- Tier 1 criteria Areas of Conflicting Use (Slides 14 to 16): The ZSF contains cable corridors, and installed cables. There are no pipelines in the open waters of the ZSF. Vessel density data (Slide 15) show the preferred commercial vessel traffic along the long axes of the ELIS and BIS. (The density grid was created using tracklines that were generated from the 2009 United States Automatic Identification System Database; the data grids represent only 339 days in 2009.) The recreational boating traffic occurs closer to shore, and between harbors in Connecticut and New York, as expected. The layer for Conservation Areas (Slide 16) is still being developed; additional data are being sought from cooperating agencies.
- *Tier 1 criteria Biological Resources (Tier 17 to 18):* Shellfish bed data for Connecticut are based on currently available data in the CTDEEP database; data are still needed for Rhode Island and New York. Similarly, fishing area information so far is only available for Rhode Island. CTDEEP has been conducting trawl surveys in Long Island Sound. The data is being evaluated for appropriate incorporation into the screening layers.

- *Tier 2 criteria Biological Resources (Slides 22 to 23):* Eelgrass bed information has been added for New York and Rhode Island. Frank Bohlen stated that the information for Connecticut requires refinement; he will provide a report with updated information. Shellfish zoning information is still being sought for New York. Jennifer Street stated that zoning information is available in New York State's database.
- Tier 2 criterion Active and Historic Sites (Slide 24): The Marine Protection, Research, and Sanctuaries Act (MPRSA) states that, wherever feasible, USEPA will designate open-water dredged material disposal sites that have been used historically. There are two active and five historic sites within the ZSF in water depths greater than 18 m (60 feet). This depth was used in the Central/Western Long Island Sound EIS as a screening layer due to the potential resuspension of sediment in shallower waters.
- *Tier 2 criterion Archaeological and Cultural Resources (Slide 25):* The data were obtained from NOAA's database and distinguish ship wrecks and 'obstructions'. There are four shipwrecks/obstructions located within the historic Clinton Harbor Disposal Site.
- Alternative Energy (Slides 29 to 32): The information was obtained from the U.S. Department of Energy. The 'Wind Power Classification' within the ZSF is comparatively low, indicating low wind energy potential relative to other offshore locations nearby. Similarly, the 'Wave Power Density' (a measure for wave energy potential) is low compared to the open ocean. The 'Kinetic Power Density' (a measure for tidal energy potential), is highest in the 'Race', but overall the tidal energy potential within the ZSF is small relative to the area south of Cape Cod.
- Dredging needs for the Long Island Sound area for a 20-year horizon (from DMMP, 2009, Dredging Needs report): The greatest dredging needs exist in Connecticut. Transportation costs increase with increasing travel distance from a dredging center. In addition, larger waves in Block Island Sound and the open ocean increase the environmental risk through 'short dumps'. MPRSA states that the USEPA will designate ocean dumping sites beyond the edge of the Continental shelf, wherever feasible. However, due to the broad shelf along the eastern United States, the distance from the Connecticut coast to the edge of the Continental Shelf (200 m depth) is approximately 80 nautical miles.

Comments made at the end of the first part:

• Charles deQuillfeldt stated that the Plum Gut and the Race are important recreational fishing areas. Bernward Hay stated that there is fishing data available through CTDEEP's trawl surveys that is currently being reviewed.

The second part of the presentation focused on potential alternative sites. Bernward Hay discussed key issues for consideration in the selection (*Slide 33*), and presented an overview of eleven potential sites selected based on the initial screening. These sites include the following:

Eastern Long Island Sound (Slide 34):

- 1. Cornfield Shoal Disposal Site (active site)
- 2. Six Mile Reef Disposal Site (historic site)
- 3. Clinton Harbor Disposal Site (historic site)
- 4. Orient Point Disposal Site (historic site)
- 5. Niantic Bay Disposal Site (historic site)
- 6. New London Disposal Site (active site)

Block Island Sound (Slide 35):

7. Deep Hole south of Fishers Island – West (new site)

- 8. Deep Hole south of Fishers Island East (new site)
- 9. Deep Hole south of Fishers Island Center (new site)
- 10. Block Island Sound Disposal Site (historic site)
- 11. Area north of Montauk (new site)

Bernward Hay then discussed each site in more detail, based on relevant available information (*Slides 36 to 60*). (Information on bathymetry, sediment texture, key morphological features, etc. is included on the slides.) A preliminary assessment for each site included identifying relative advantages (+), relative disadvantages (-), neutral (o), and missing data (?). He concluded with a slide that summarized these factors (*Slide 61*). This slide was designed to start the discussion for comparing sites.

Comments after the presentation consisted of the following:

- Kari Garhen stated that she appreciated the incremental process of going through the data, but thought that it was premature to identify any site on such limited data. She was concerned that there appeared to be a conclusion made about biological habitats in the area without recognizing other activities or available data such as toxicity levels, or cumulative impacts from previous dumping. She noted that the New London Disposal Site was given a' plus' for biological resources [on the summary table -Slide 61], although there was no acknowledgement of the historical use of this site and the level of toxicity present there. She also questioned the ability to draw any conclusion on mound stability in the absence of any recognition that there may be disagreement historically as to whether or not material that has been disposed at the site can still be accounted for, located, and documented to this date. Therefore, she questioned the neutrality symbol [o] used for historical disposal sites, as she believed the conclusion was premature. She also questioned the perception that open water disposal sites (OWDS) needed to be in close proximity to dredging centers, and asked how this compared to other USEPA Regions nationwide, and asked further if there was an expectation that OWDS needed to be within 5 nautical miles (nm) from dredging centers. She believed that distance to dredging centers should not be on the summary table without having a better understanding of why this should be a factor for site selection. She further stated that she was not sure how conclusions regarding biological data were made. Specifically, New York has Significant Coastal Fish and Wildlife Habitats, and none of them were included on the maps, which she thought was needed considering that sediment moves around and could impact such areas. The web link for this information was provided by Jennifer Street.
- Jean Brochi responded that the current information was based on best available information. Existing data is being reviewed and incorporated, so that additional data needed for this process can be identified.
- Diane Rusanowsky stated the Northeast Region National Marine Fisheries Service is preparing a GIS-based vehicle for expressing Essential Fish Habitat (EFH) that might be helpful. The contact is David Stevenson. She noted that the data in nearshore areas is not as detailed. The U.S. Fish and Wildlife Service (USFWS) has a similar habitat designation program that was prepared for certain New England and Rhode Island coastal areas that could be added as overlays. Peter Foster is working on a project that consists of a review of a number of different uses and current data (including fish survey data) for NY and CT; he is putting this information into GIS format.
- Charles deQuillfeldt stated that the Long Island Sound Study (LISS) has various stewardship sites identified both along the CT and NY shoreline (including Plum Island and a number of other sites). There might be GIS maps available to be obtained from the LISS website.
- Mel Cote, in response to Kari Garhen's comments, stated that there was no set distance between dredging centers and disposal sites. There is a wide range nationwide (from a few miles up to perhaps

50 miles), but the vast majority of disposal sites are within 5 to 10 miles from shore. He will provide a link with the coastal disposal sites in all USEPA regions. It shows that Region 1 has fewer disposal sites than most regions and they are spread further apart, but, overall, Region 1 is not an anomaly.

- Kari Garhen asked if these sites were actively used. Mel Cote responded that they vary considerably in term of use.
- Bernward Hay asked if any one of the eleven identified site for the ELIS SEIS could be taken of the list at this time for specific environmental or other reasons. Charles deQuillfeldt stated that the Orient Point and Montauk sites will be of concern because of fishing, recreational boating, and reaction from the public to those sites. Mel Cote noted that most dredged material disposal activity occurs between October and March, thus avoiding the season of heavy recreational use.
- Jean Brochi stated that the preliminary summary information will be revisited, other data will be reviewed, and data gaps will be identified. It will include habitat and biological resources, fisheries, as well as archaeological and cultural resources. The USEPA will reach out to tribes to identify culturally significant areas. Another issue will be mound stability; physical oceanographic data will be available in about a month for preliminary review. Ms. Brochi stated further that the SEIS process pertains to the open-water portion of the project area; the dredging need was established by the DMMP project. The USEPA will also review a no-action alternative and other alternatives. She further stated that the slides of today's presentations will be made available in pdf format. She asked for comments and recommendations.

Break for lunch between approximately 12:00pm and 12:30pm.

After lunch, Jim O'Donnell presented an update of his physical oceanography study "Observation and Model Plan and Status (Appendix C). The overview included the scientific background, modeling approach, and field observation plan.

The meeting was adjourned at approximately 1:30pm.

Appendix A: Invitation and Agenda

(Jeannie Brochi, USEPA)

From: Brochi, Jean [mailto:Brochi.Jean@epa.gov]

Sent: Thursday, May 16, 2013 4:31 PM

To: Jennifer.Street@dos.ny.gov; dgoulet@crmc.ri.gov; jwillis@crmc.ri.gov; george.wisker@ct.gov; joseph.salvatore@ct.gov; mark.l.habel@usace.army.mil; Nancy.J.Brighton@usace.army.mil; Catherine.J.Rogers@usace.army.mil; Lou.chiarella@NOAA.gov; diane.rusanowsky@noaa.gov; dxmcreyn@gw.dec.state.ny.us; Benjamin.J.Duarte@uscg.mil

Cc: Pechko, Patricia; Pabst, Douglas; Grimaldi, Alicia; Pechko, Patricia; Pabst, Douglas; Cote, Mel; Hamjian, Lynne; Grimaldi, Alicia; Hay, Bernward; O'donnell, James (james.odonnell@uconn.edu); Atamian, Amy; Bohlen, Walter (walter.bohlen@uconn.edu); Jennifer.Street@dos.ny.gov; dgoulet@crmc.ri.gov; jwillis@crmc.ri.gov; george.wisker@ct.gov; joseph.salvatore@ct.gov; mark.l.habel@usace.army.mil; Herter, Jeff (DOS); Nancy.J.Brighton@usace.army.mil; Catherine.J.Rogers@usace.army.mil; Lou.chiarella@NOAA.gov; diane.rusanowsky@noaa.gov; dxmcreyn@qw.dec.state.ny.us; Benjamin.J.Duarte@uscq.mil

Subject: FW: MONDAY MAY 20th 10-2 WEBINAR LIS SEIS Cooperating Agency Meeting #2

Hello,

On Monday, May 20th, EPA will host the 2nd Cooperating Agency meeting for the LIS SEIS. The agenda and some handouts are attached to this email. I have also attached the public scoping report document for your review. Please provide comments by June3rd.

The objective of the meeting is to discuss the site screening process, review available data in GIS, and recommend open water locations for further investigation. Thank you for your assistance.

You may join the webinar by clicking on the following link:

Invited By: Jean Brochi (Brochi.Jean@epa.gov)

Where: https://epa.connectsolutions.com/r4r7l6bifb3/

When: 05/20/2013 9:45 AM - 2:45 PM

Time Zone: (GMT-05:00) Eastern Time (US and Canada)

The call in number is:

with a start date and time of 05/20/2013 10:00 AM and a ending date and time of 05/20/2013 02:30 PM

Dial-In Number: (617) 918-2823

Password: 355003



May 20, 2013 - CT DOT, WEBINAR (Adobe Connect)

ELIS SEIS Cooperating Agency Meeting #2

Agenda

10:00 am	Introductions/Objectives Jean Brochi, EPA
10:15 am	Physical Oceanographic Study Jim O'Donnell, UCONN
10:30 am	ELIS SEIS Site Screening Bernward Hay, LBG
12:00 pm	Break
12: 30 pm	ELIS SEIS Site Screening (continued)
1:00 pm	Discussion
2:00 pm	Wrap Up/Next Steps (Factsheet, Public Scoping Report, Public Scoping Meetings)

Appendix B: Presentation - Site Screening

(Bernward Hay, Louis Berger Group, Inc.)

Eastern Long Island Sound Supplemental EIS (SEIS):

GIS Screening for Potential Alternative Dredged Material Disposal Sites

Cooperating Agency Meeting 2
May 20, 2013

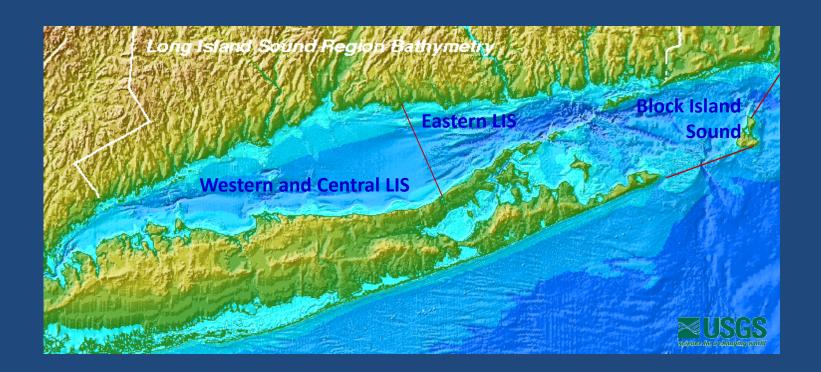






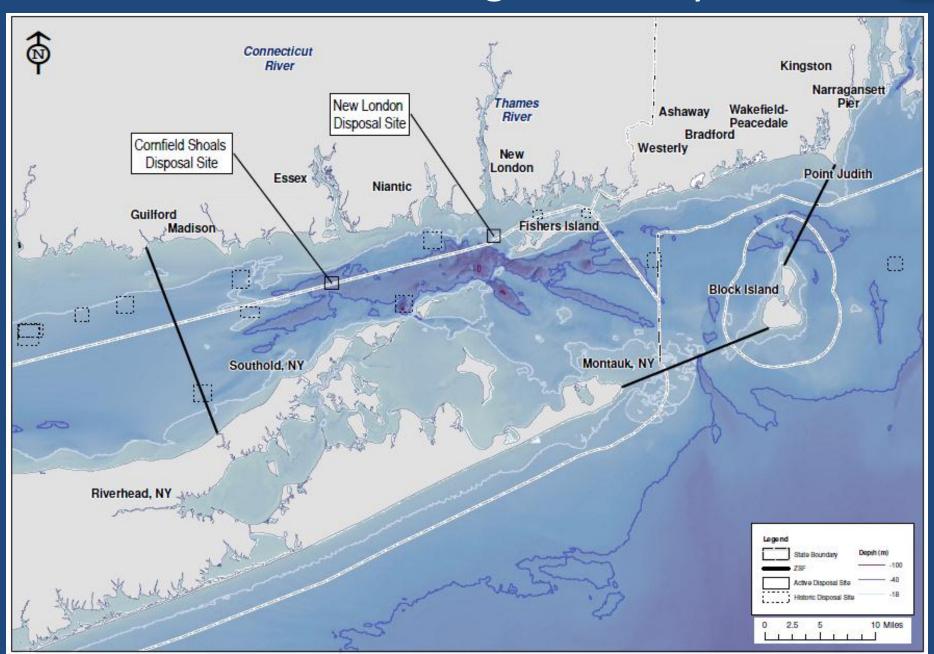
Zone of Siting Feasibility

 SEIS will address the eastern region of Long Island Sound, and Block Island Sound



Zone of Siting Feasibility







Screening Objective

Identify....

- Areas within the ZSF acceptable for locating an open water disposal site designated under the Ocean Dumping Regulations
- Specific alternative disposal site(s) within the acceptable area(s) for further evaluation in the SEIS



General Approach to Screening

- Marine Protection, Research, and Sanctuaries Act (1972):
 Criteria or ocean dredged material site designation
 - 5 general criteria (40 CFR 228.5)
 - 11 specific criteria (40 CFR 228.6)

- Screening levels
 - Tier 1 Evaluate sites
 - Tier 2 Further investigate recommended sites



Tier 1 and 2 Screening Criteria

Sediment Stability/Instability

- Bathymetry
- Currents and Waves; Bottom Stress
- Sediment Texture (resuspension potential; habitat proxy)

Areas of Conflicting Uses

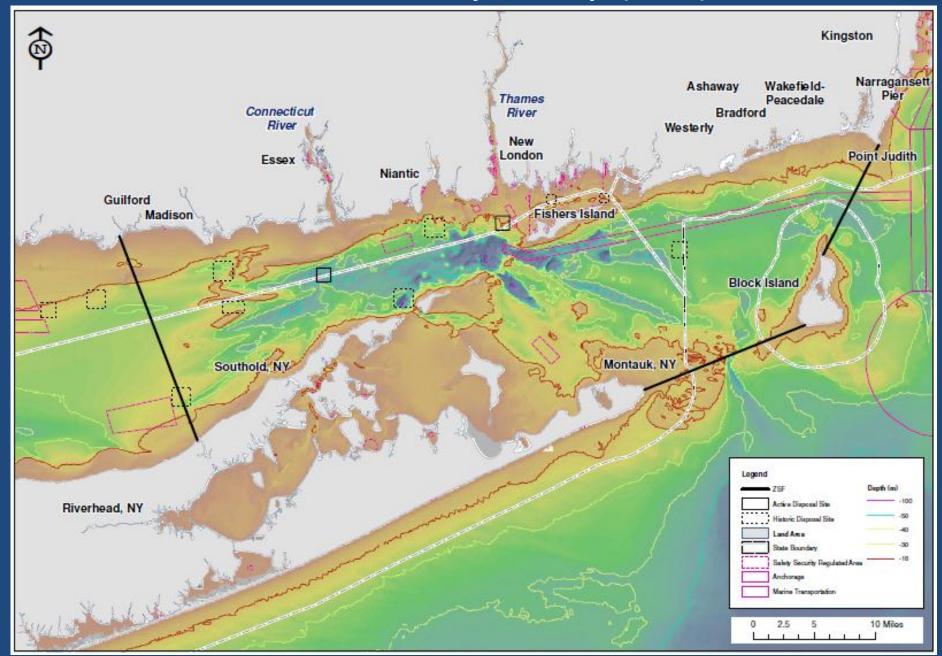
- Infrastructure (cables, pipelines)
- Navigation (shipping lanes, anchoring areas)
- Conservation Areas (sanctuaries, wildlife refuges, National Seashores, parks, artificial reefs)

Biological Resources

- Shellfish Beds
- Benthic Community
- Fish Habitat, Fish Concentrations, and Fishing Areas
- Breeding, Spawning, Nursery, Feeding, and Passage Areas

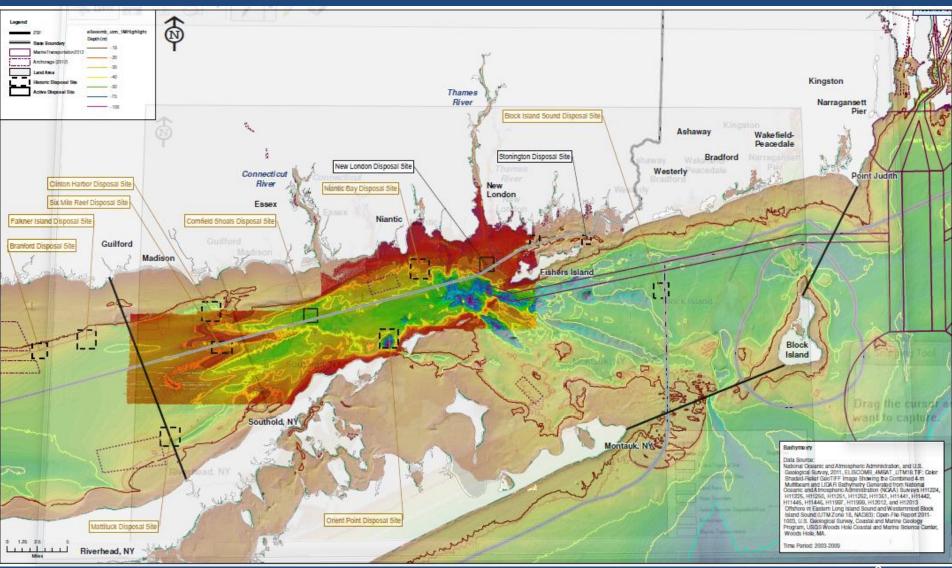
Tier 1: Bathymetry (ZSF)





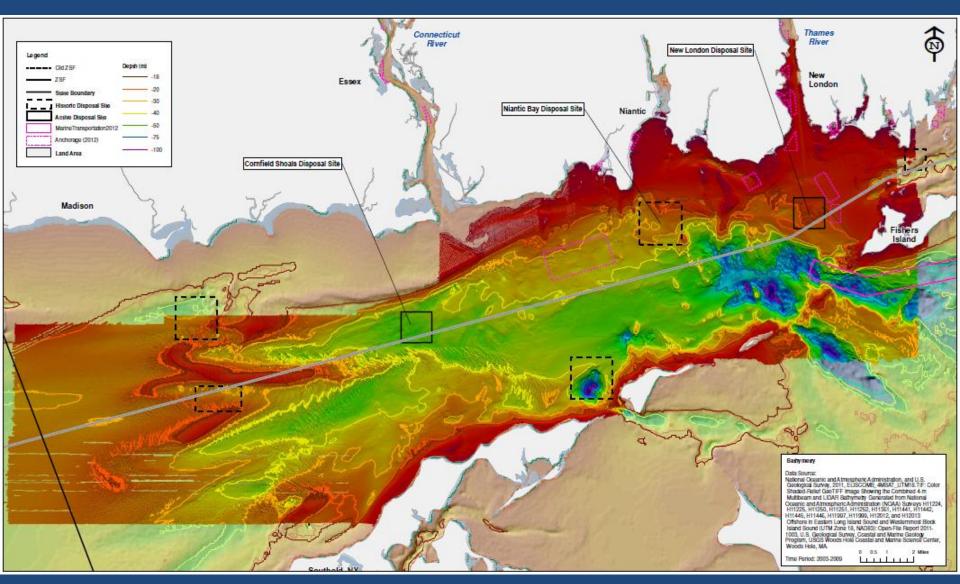
Tier 1: Bathymetry (ZSF)





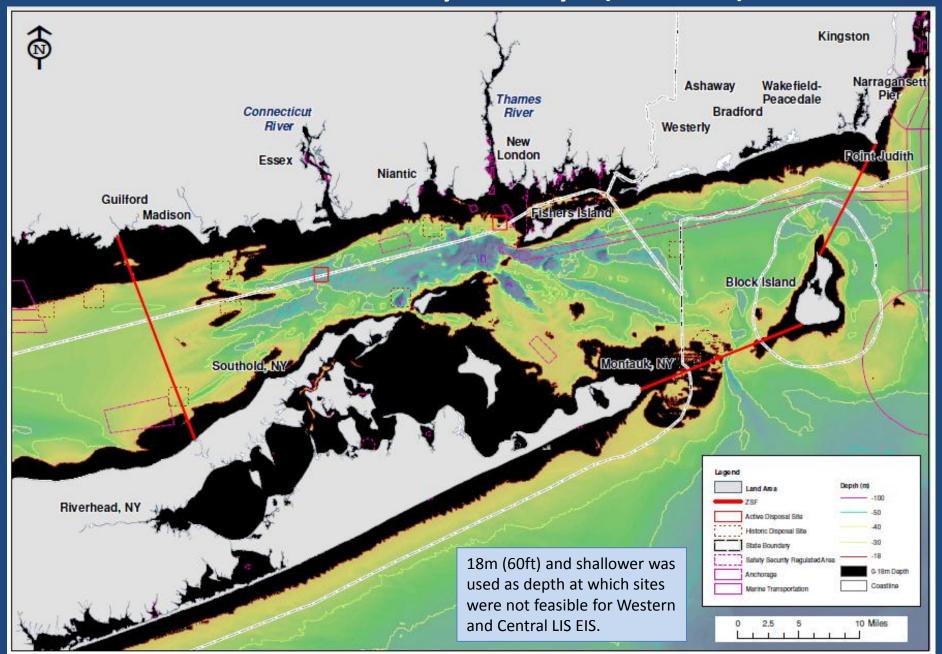


Tier 1: Bathymetry (Eastern LIS)



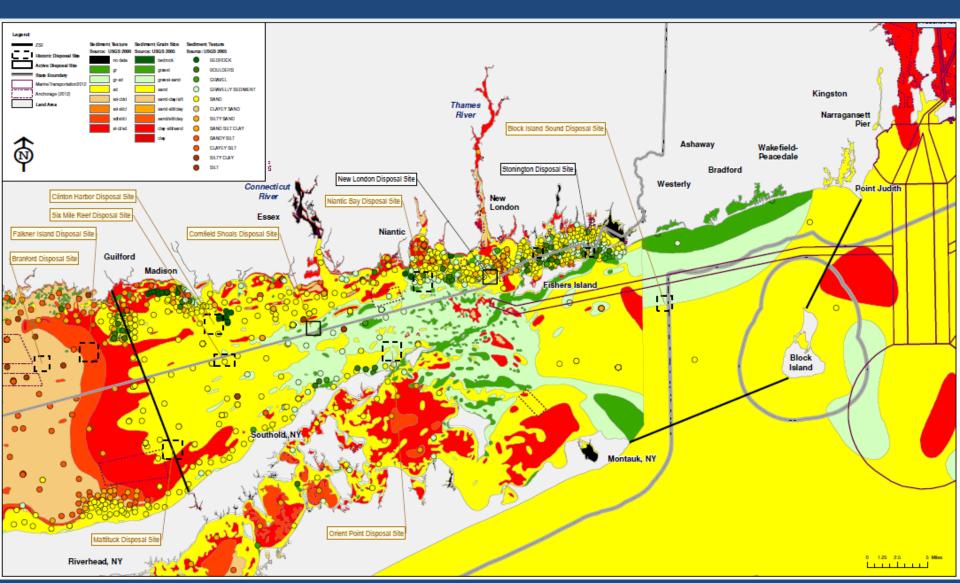
Tier 1: Bathymetry (>18 m)





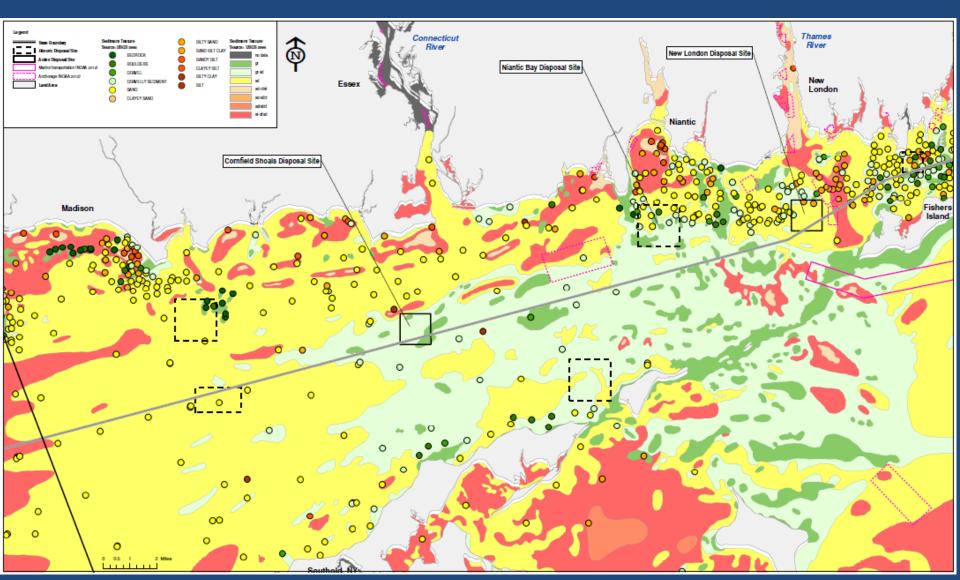


Tier 1: Sediment Characteristics (ZSF)



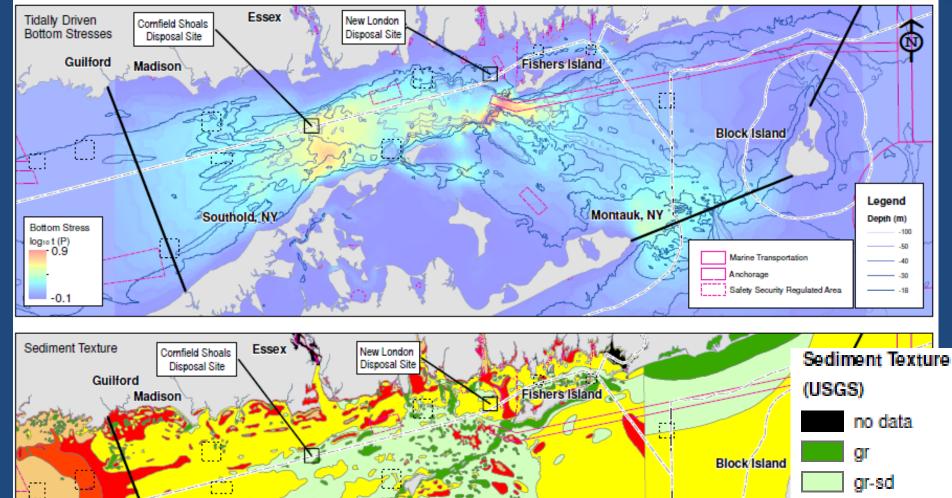


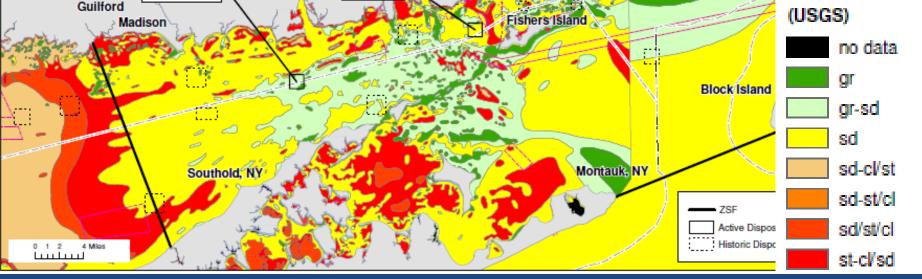
Tier 1: Sediment Characteristics (ELIS)



Tidally-Driven Bottom Stress and Sediment

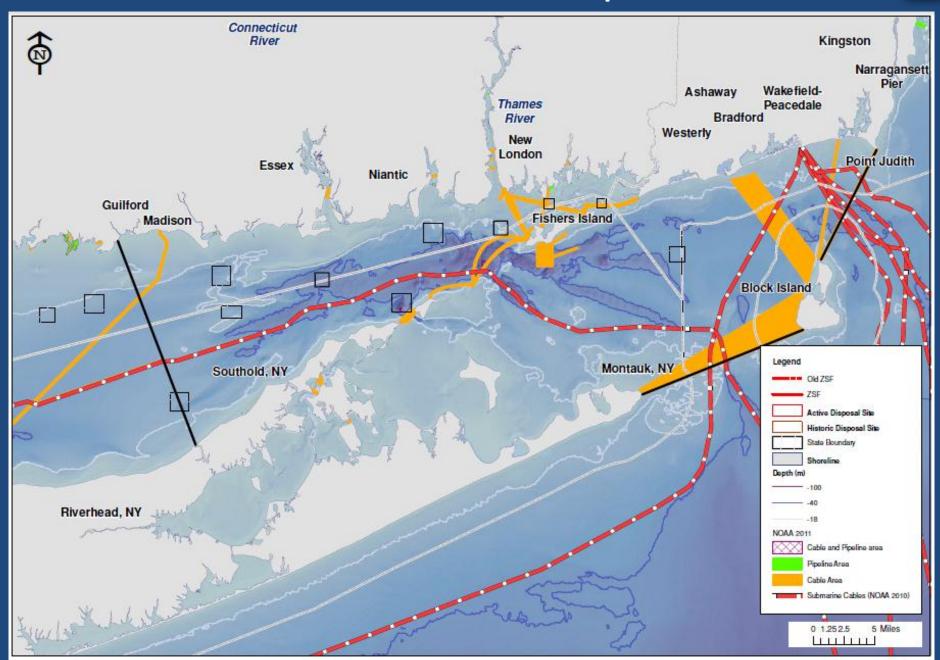






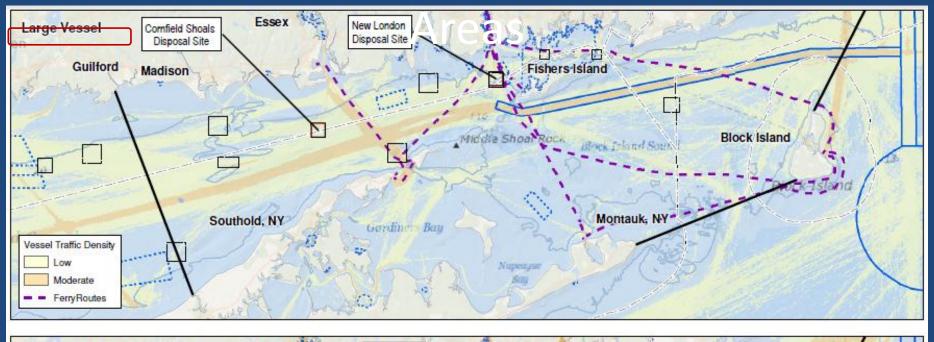
Tier 1: Cables and Pipelines

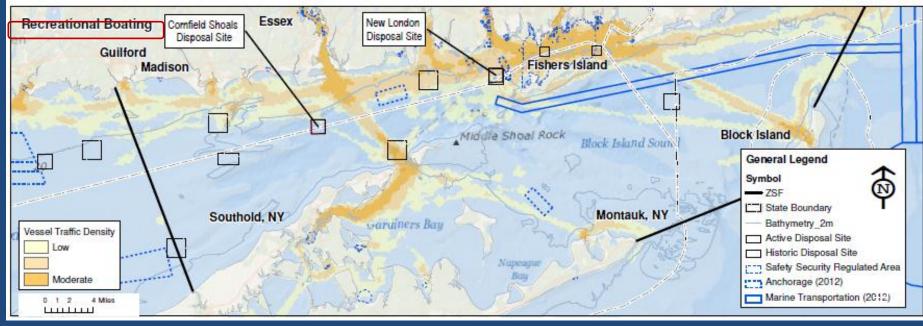




Tier 1: Vessel Traffic Density, Anchoring



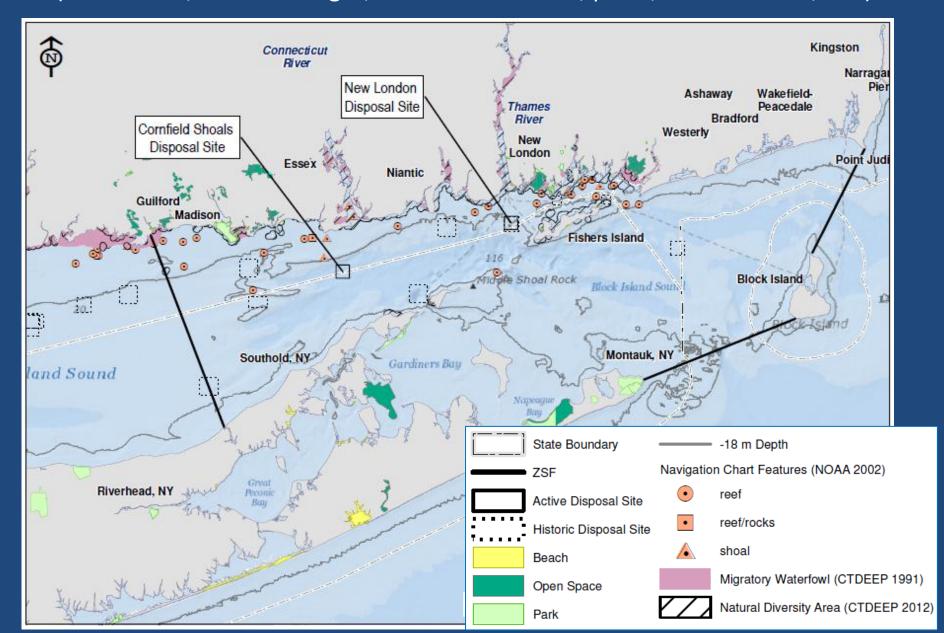




Tier 1: Conservation Areas (More data needed)

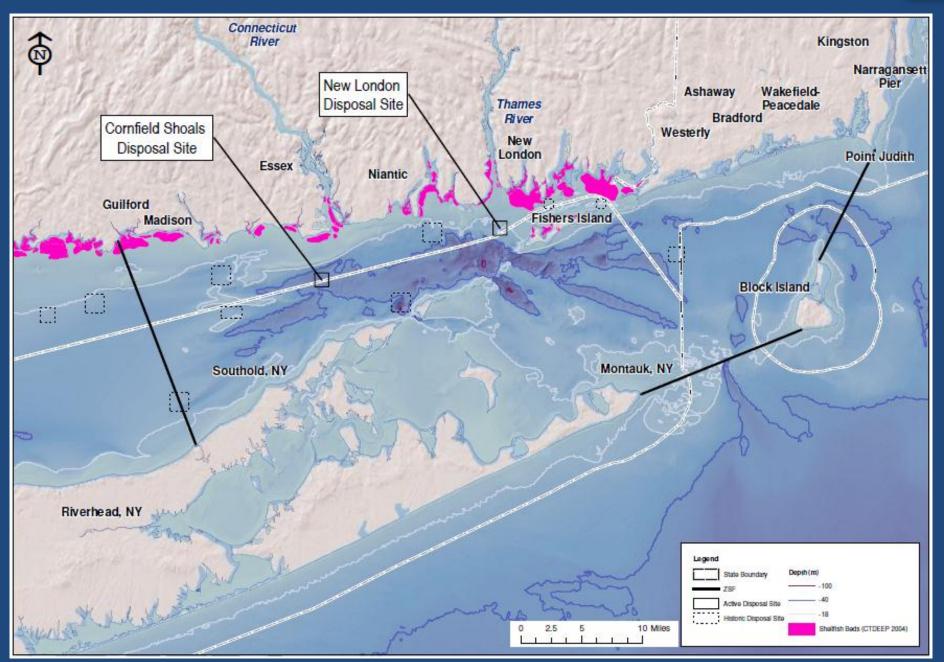


(sanctuaries, wildlife refuges, national seashores, parks, artificial reefs, etc.)



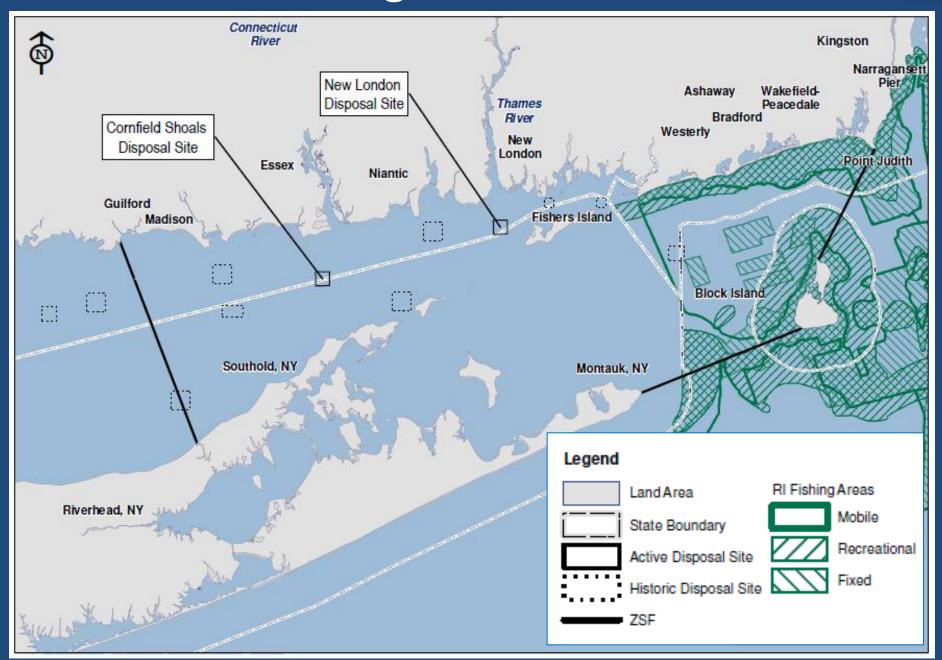
Tier 1: Shellfish Beds (NY+RI Data needed)





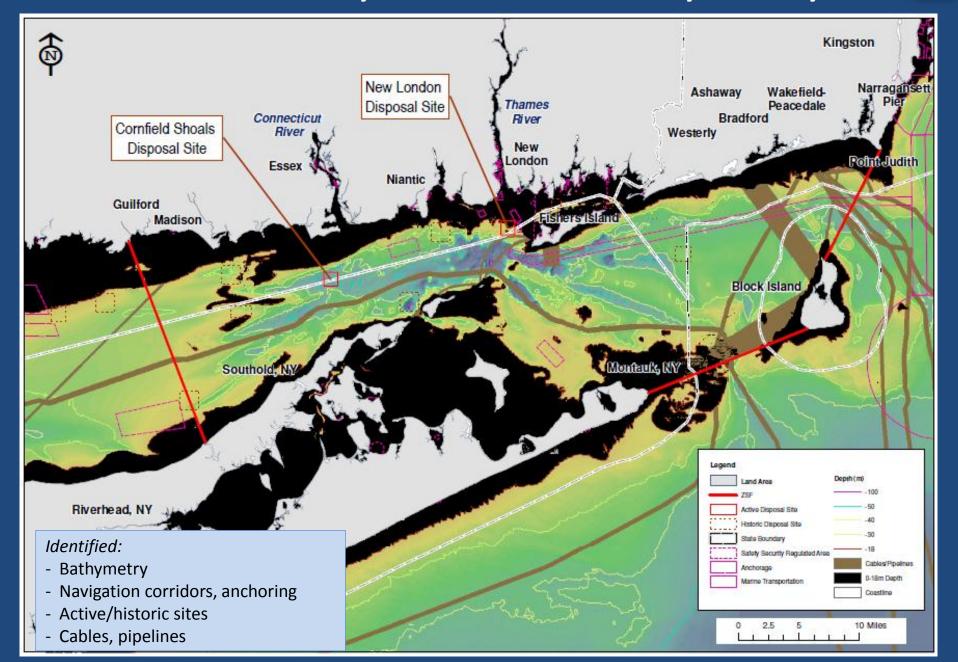
Tier 1: Fishing Areas (additional data needed)





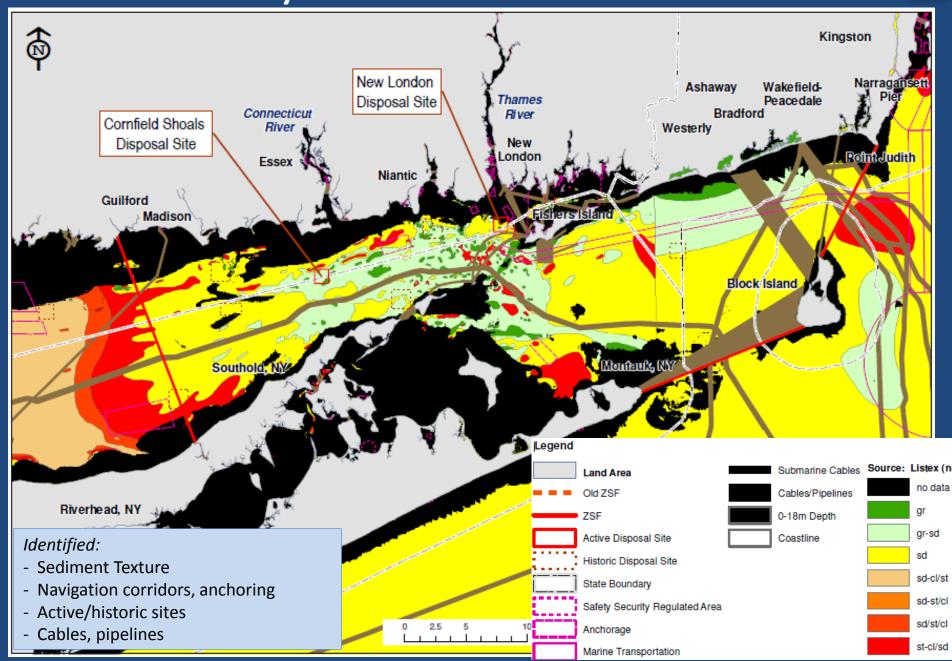
Tier 1 Overlay 1: Base - Bathymetry





Tier 1 Overlay 2: Base - Sediment Texture





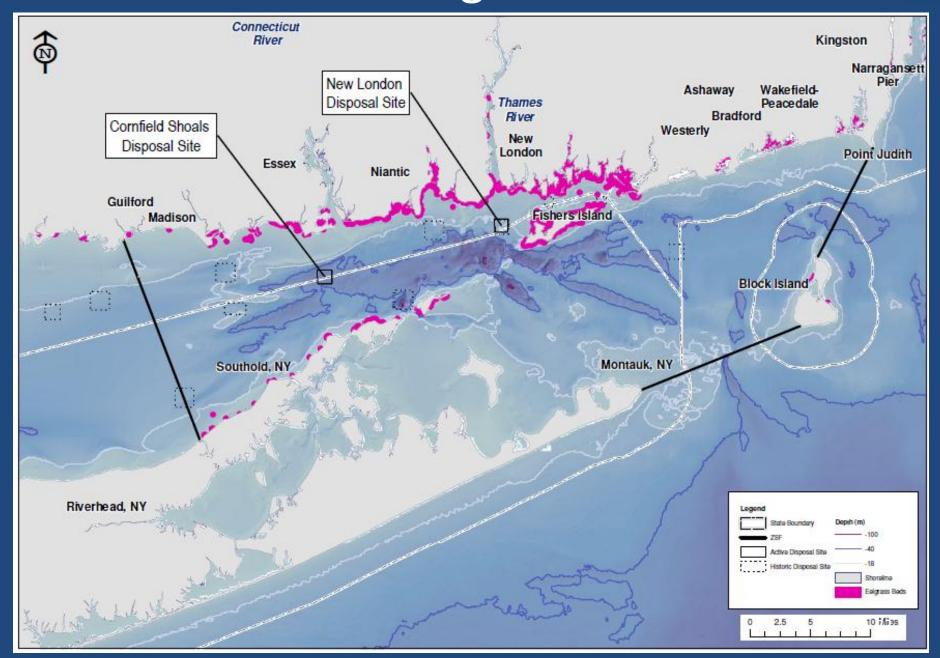


Tier 2: Key Screening Criteria

- Biological Resources
 - Eelgrass Beds
 - Shellfish Zoning
 - Essential Fish Habitat
- Active/Historic Disposal Site vs. New Sites
- Historic and Cultural Resources
- Recreation
 - Recreational Navigation
 - Proximity to Beaches

Tier 2: Eelgrass Beds

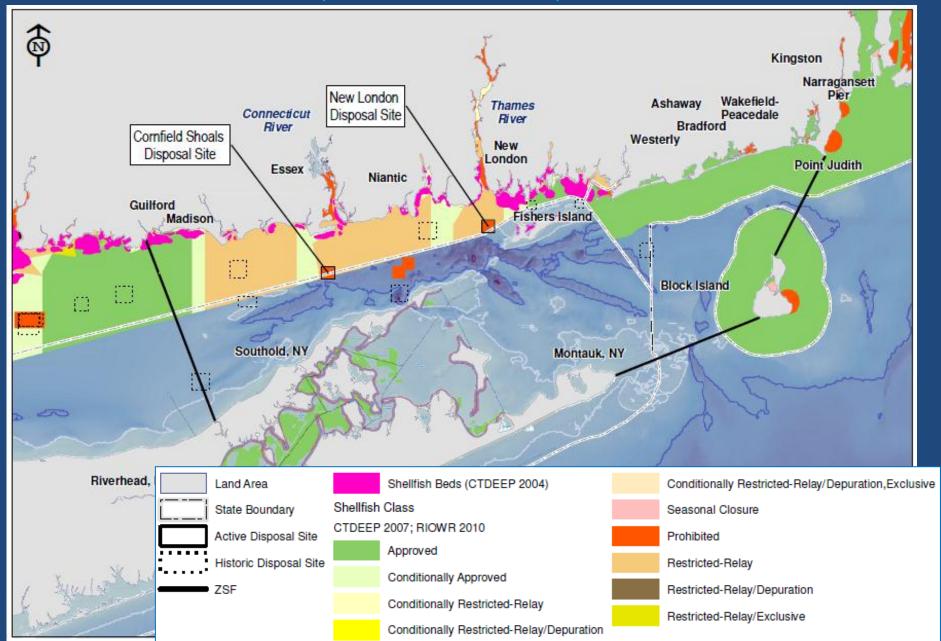




Tier 2: Approved/ Prohibited Shellfish Areas

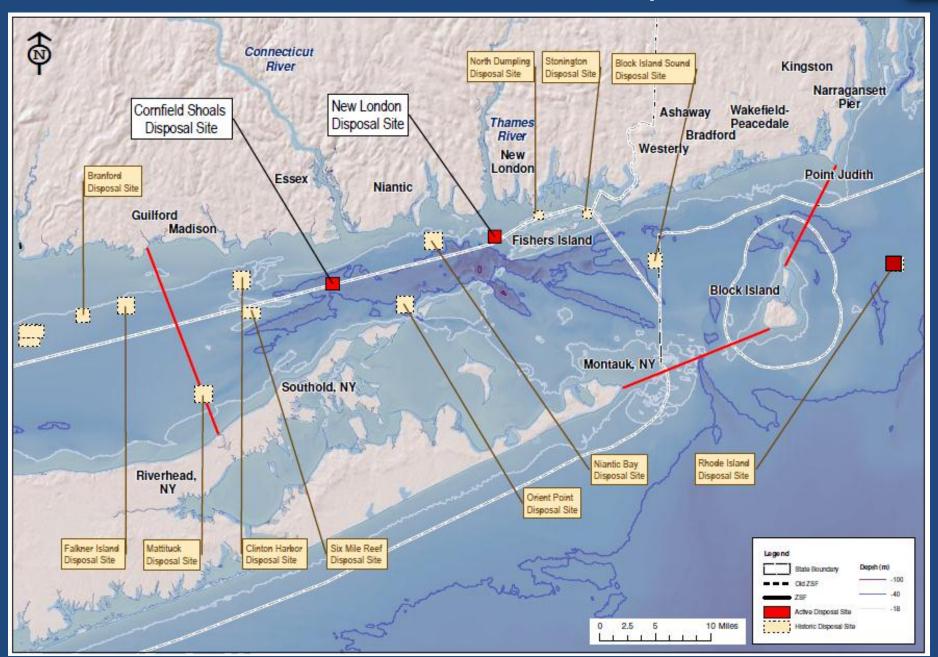


(additional NY data needed)



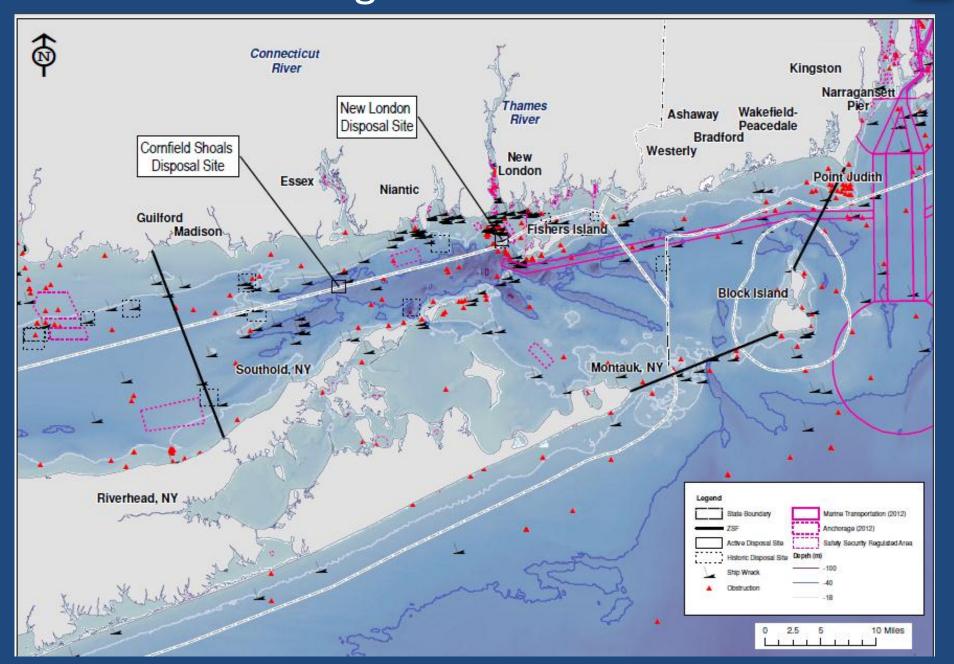
Tier 2: Active and Historic Disposal Sites





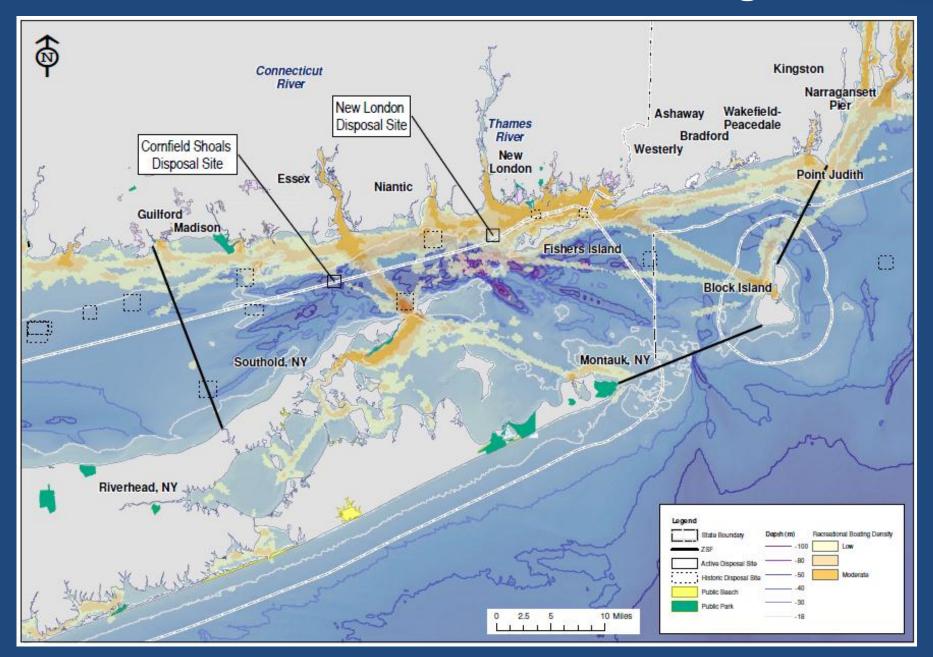
Tier 2: Archaeological and Cultural Resources





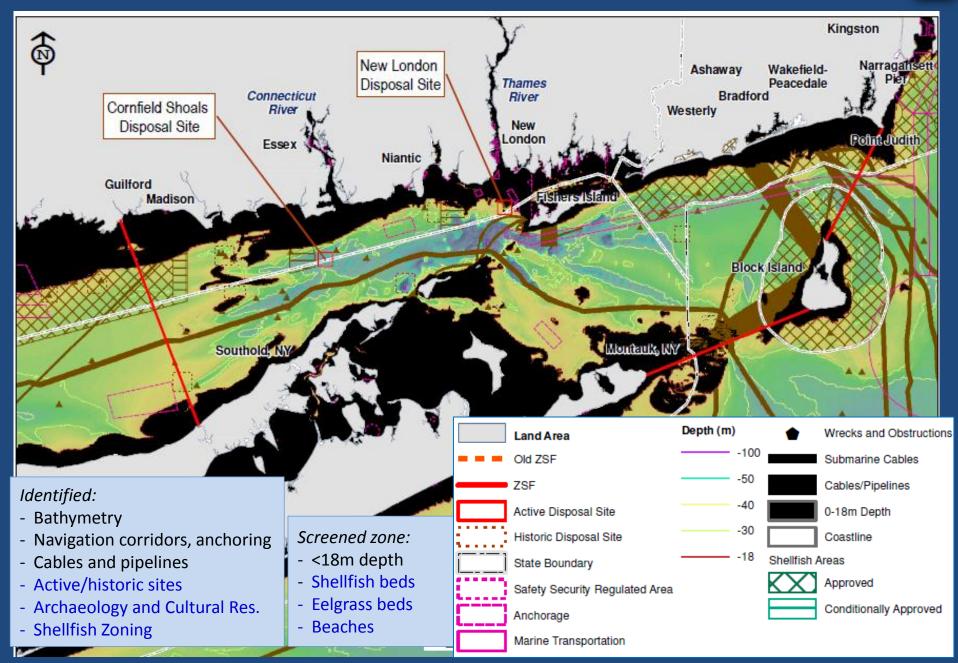
Tier 2: Recreational Areas and Navigation





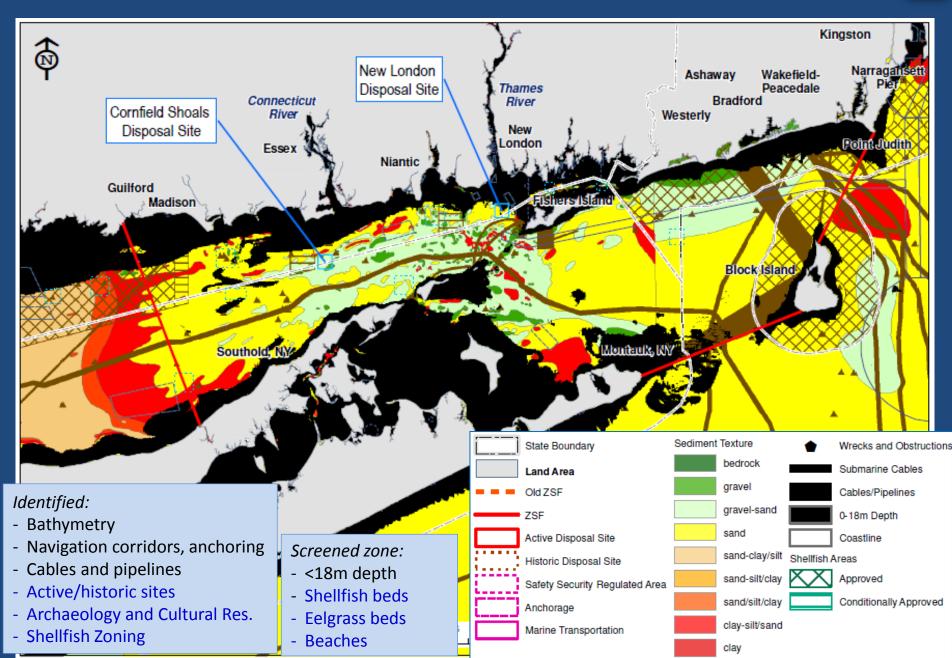
Tier 2 Overlay 1: Base - Bathymetry





Tier 2 Overlay 2: Base - Sediment Texture

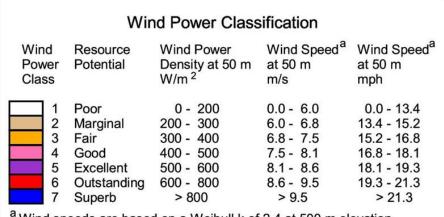




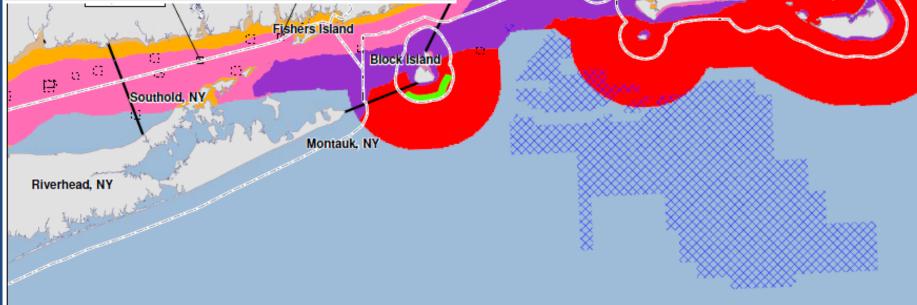
Alternative Energy – Wind



Cape Cod



^a Wind speeds are based on a Weibull k of 2.4 at 500 m elevation.

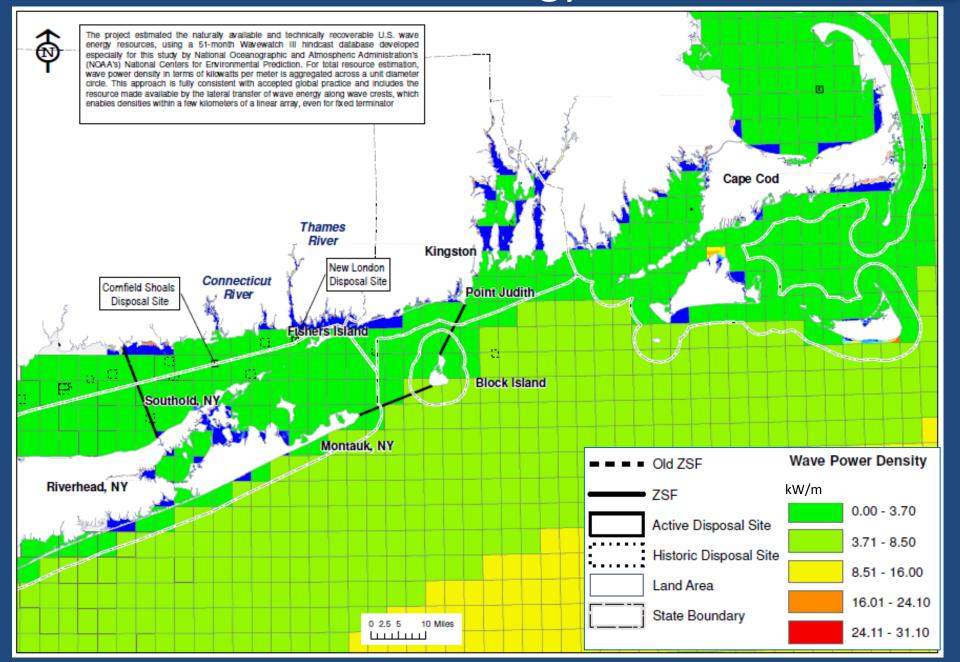


oint Judith



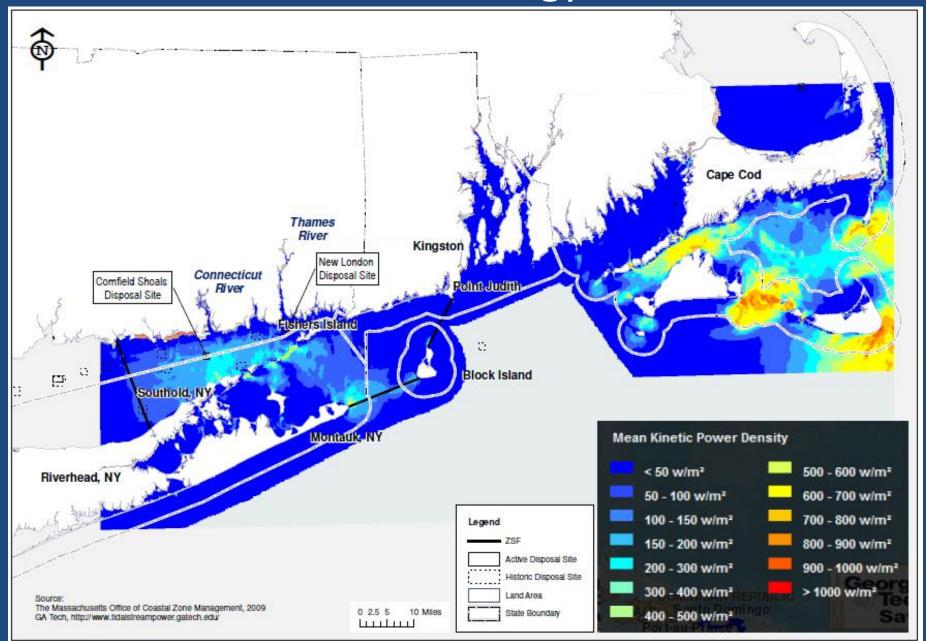
Alternative Energy – Wave





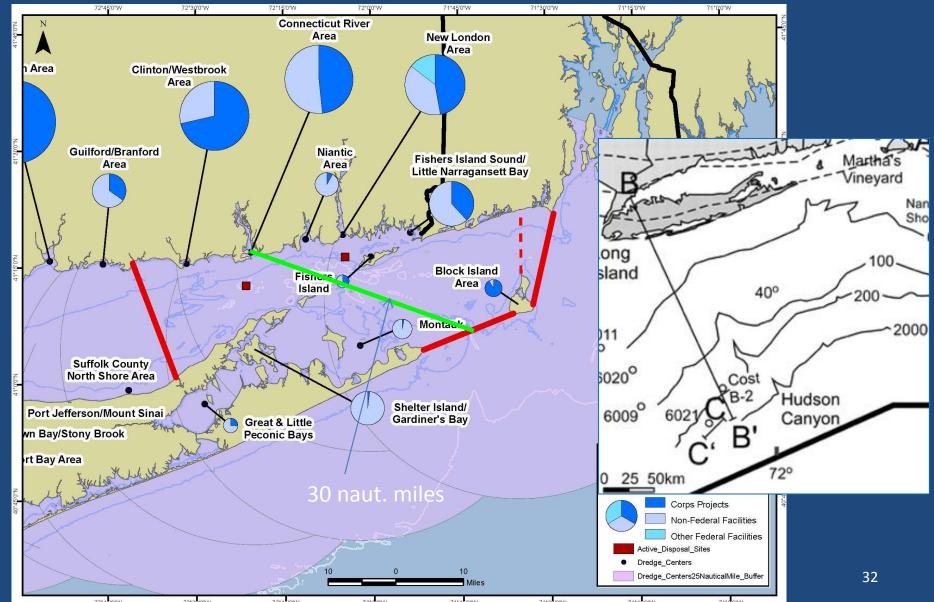
Alternative Energy – Tidal





Continental Shelf and Areas within 25 nm of Dredging Centers





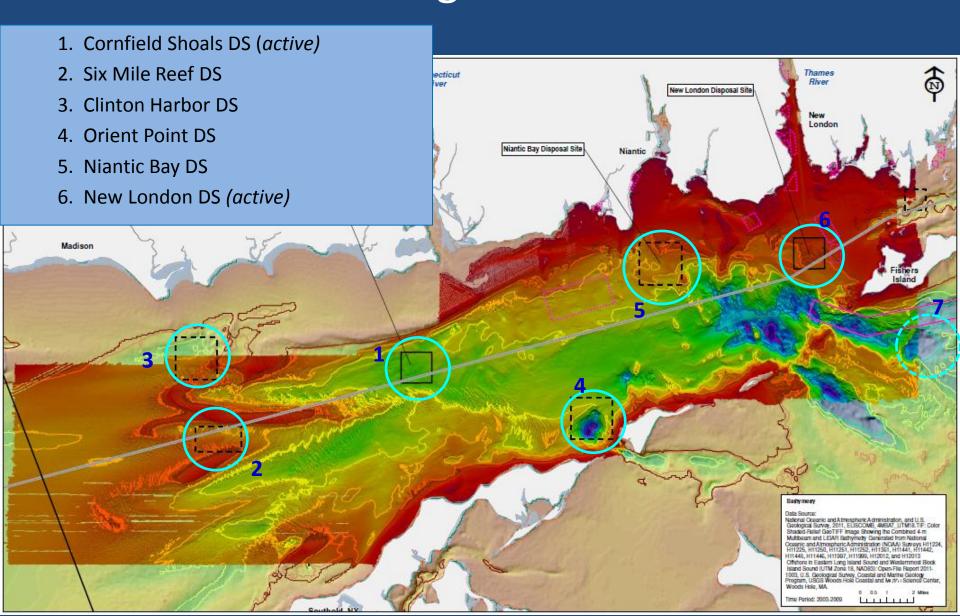


Alternative Site Discussion

- Site Characteristics
- Valuable Marine Habitats
 - Gravel and hardbottom areas were identified previously as important to maintain
- Conservation Areas
- Economy, Safety, and Environment
- Active/Historic vs New Disposal Areas

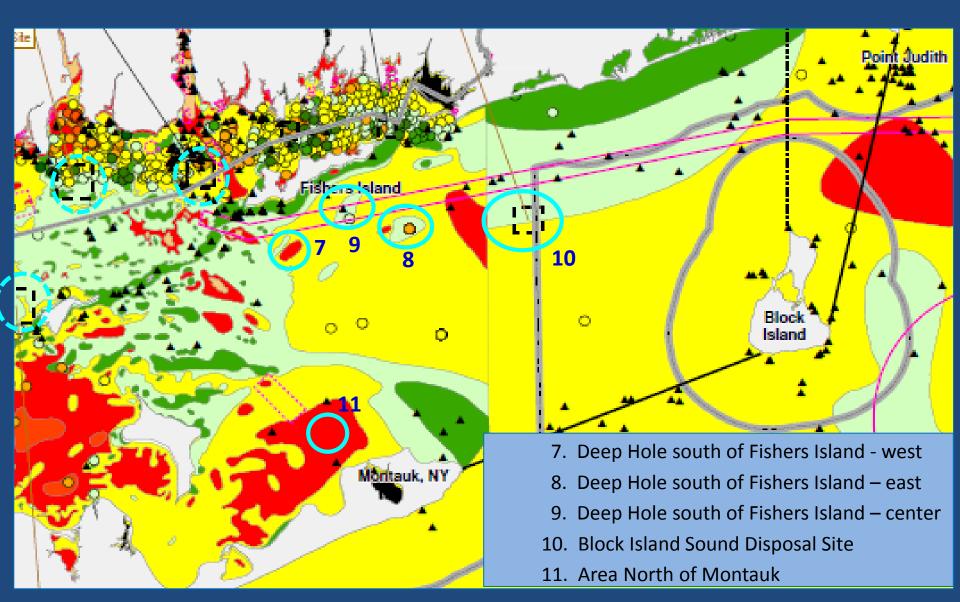
Alternative Site Discussion: Eastern Long Island Sound





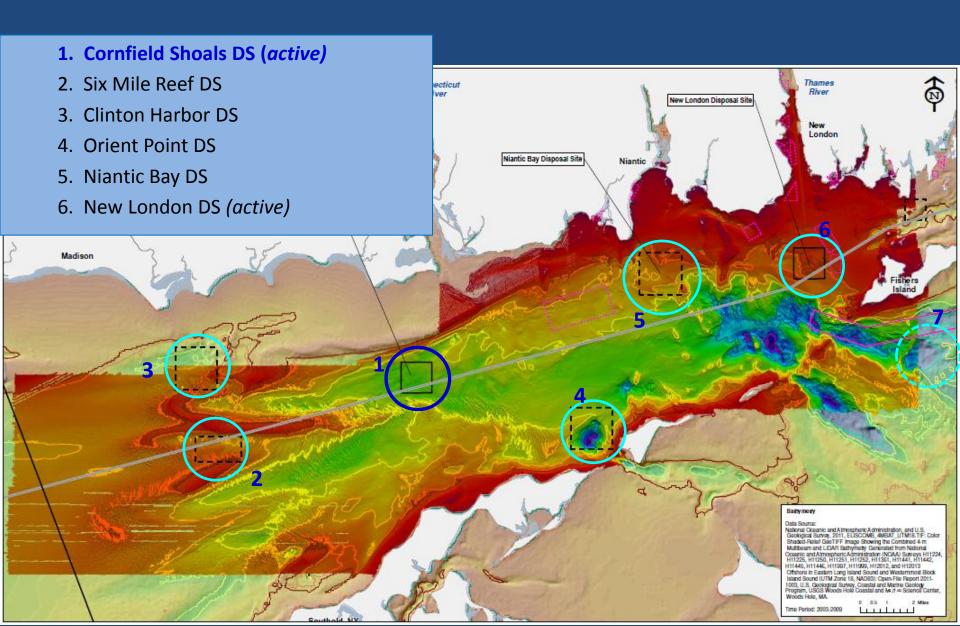
Alternative Site Discussion: Block Island Sound





Alternative Site Discussion: Eastern Long Island Sound (cont.)



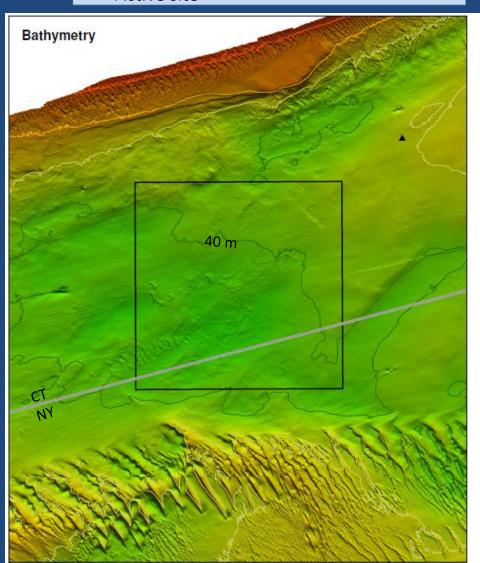


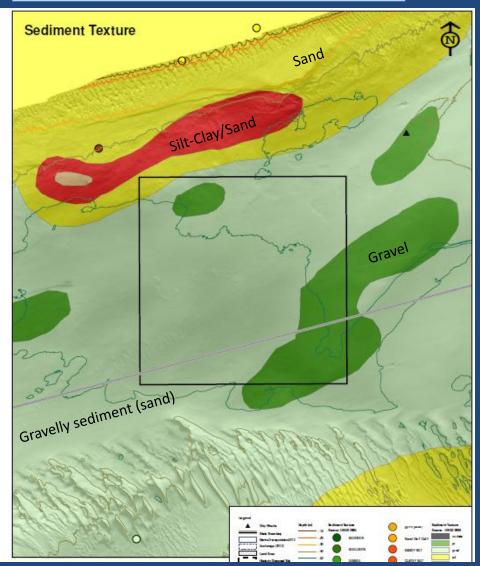
1. Cornfield Shoals Disposal Site

(1)

- + Deep area (150 ft)
- + Long Sand Shoal to north
- + Near dredging centers
- + Active site

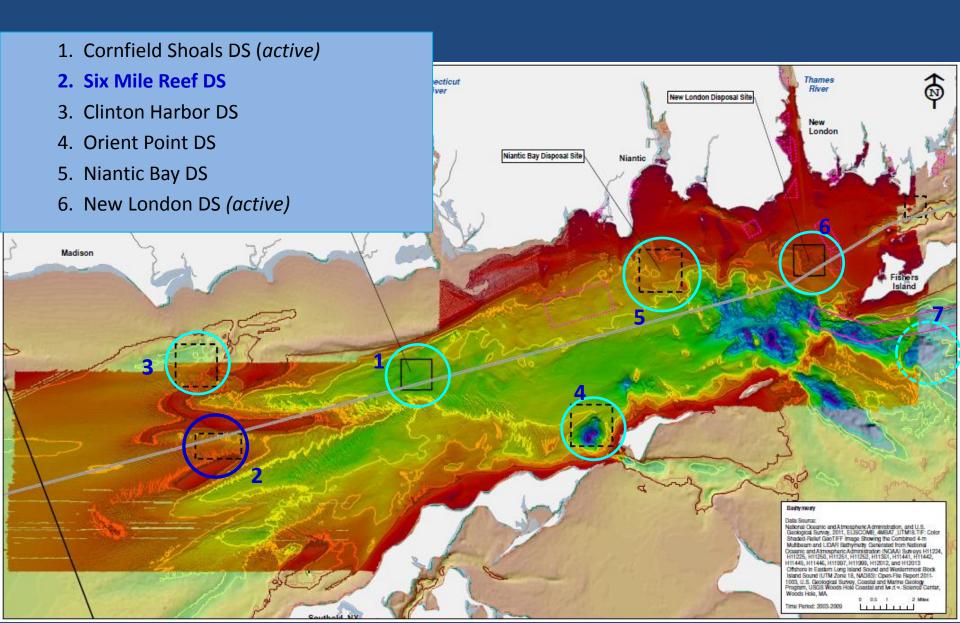
- o Zoned for restricted shellfishing (CT)
- Gravelly sand
- o Transport direction WSW-ENE





Alternative Site Discussion: Eastern Long Island Sound (cont.)



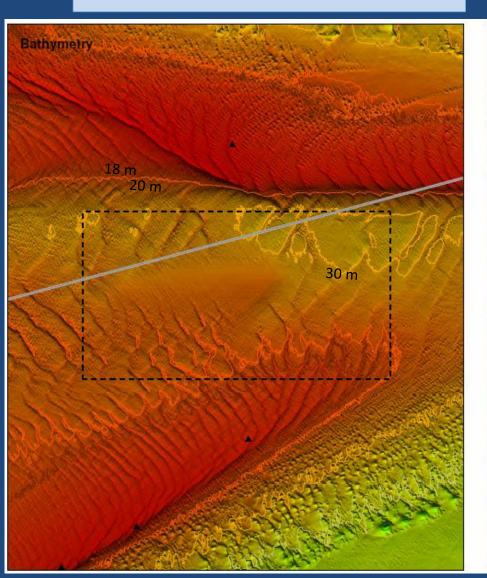


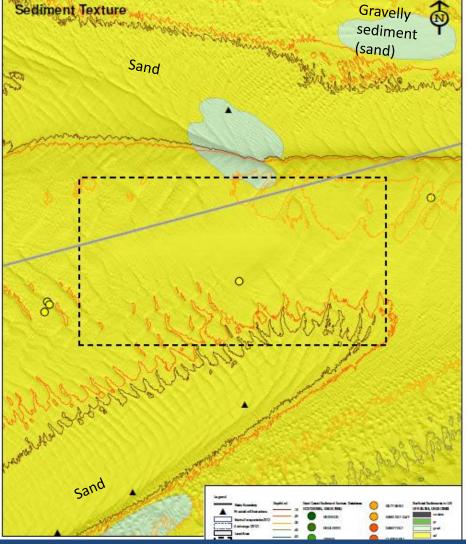
2. Six Mile Reef Disposal Site

(L)

- o Shallow (62-110 ft; 19-35 m)
- Sand waves
- + Near dredging centers (Clinton: 6 nm)

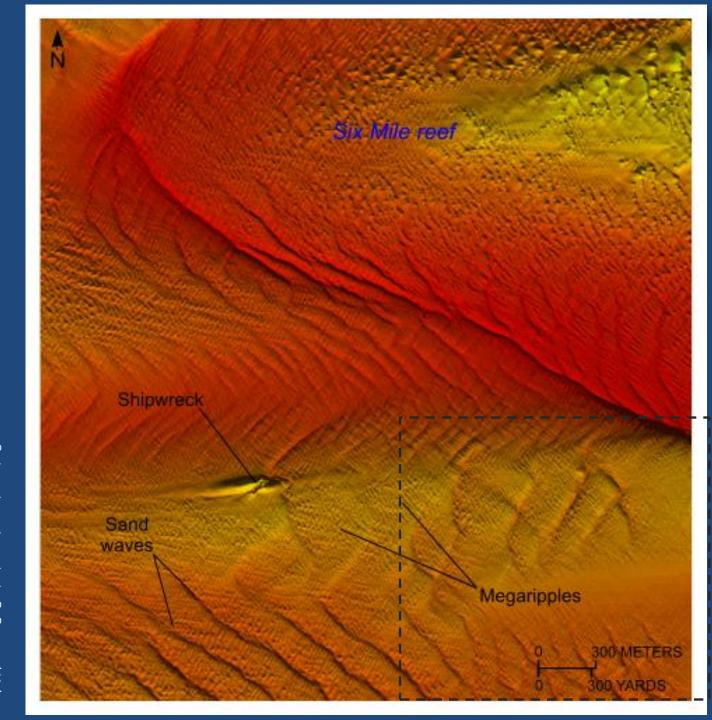
- o Historic site
- o 3.5 mi east of approved shellfishing zone (CT)
- Currents move in W-E direction





Six Mile Reef

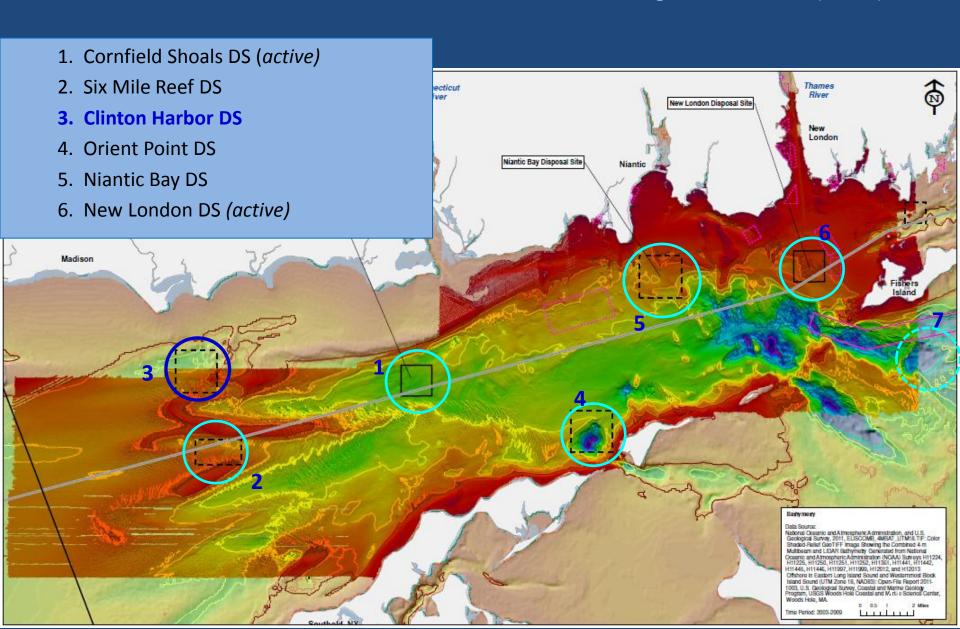
(Close-up)



http://pubs.usgs.gov/of/2011/1003/html/figures.html



Alternative Site Discussion: Eastern Long Island Sound (cont.)

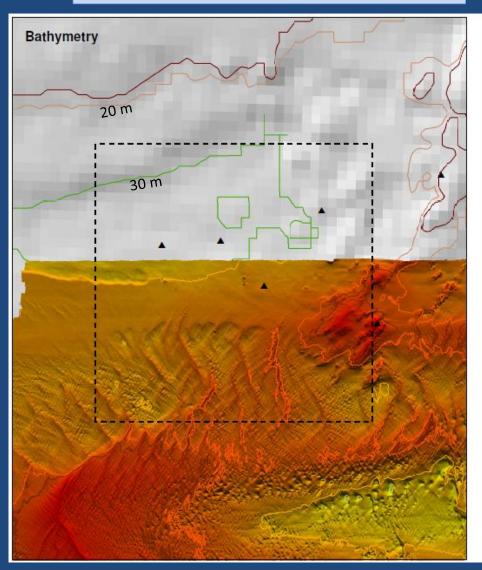


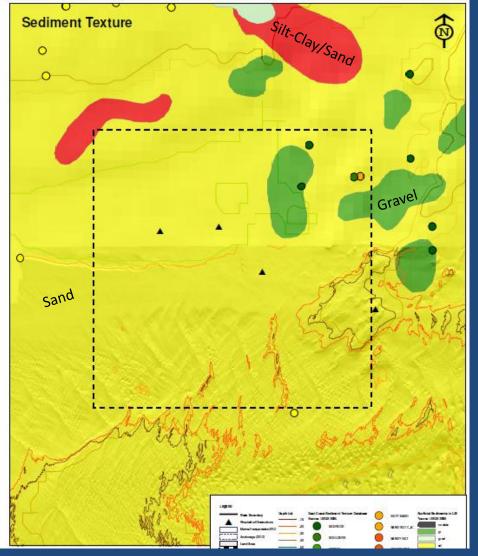
3. Clinton Harbor Disposal Site

(B)

- o Shallow depth: (up to 110 ft; 35 m)
- Sand
- + Near dredging centers (Clinton: 3 nm)
- o Historic site

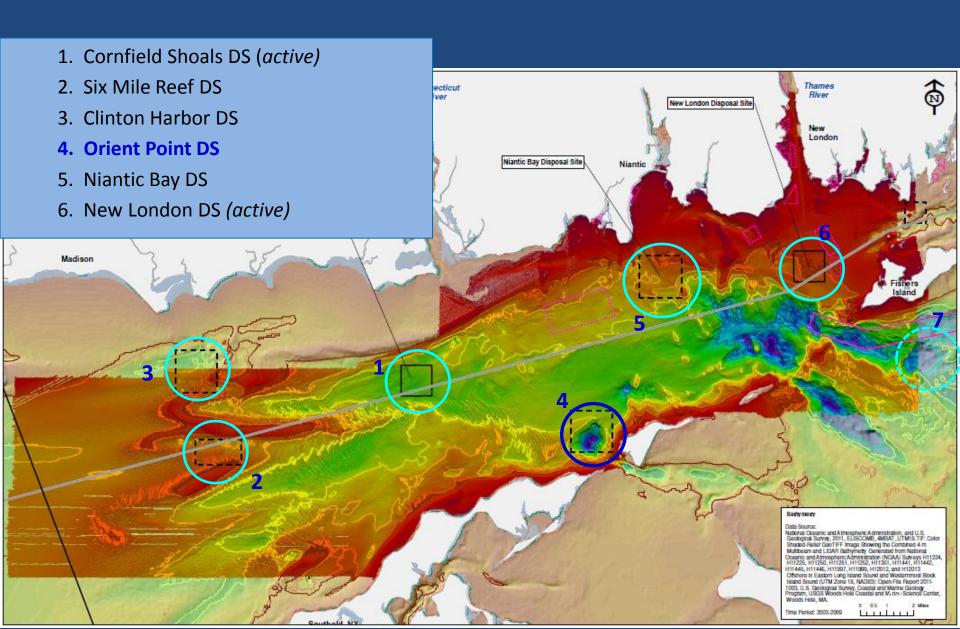
- Close to shore (1.5 nm)
- o 3 mi east of approved shellfishing zone (CT)
- ? Biological resources (gravel and rocky areas in NE)
- ? Archaeological resources (4 wrecks)





Alternative Site Discussion: Eastern Long Island Sound (cont.)



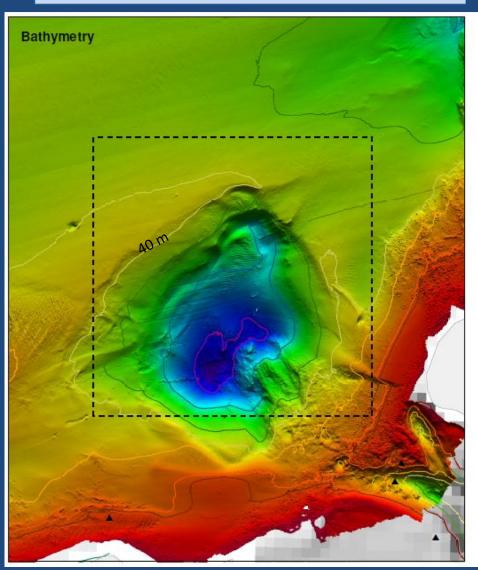


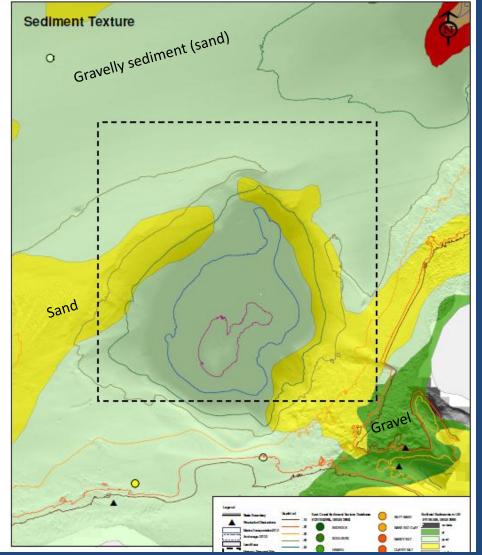
4. Orient Point Disposal Site

(B)

- + Deep depression (300 ft; 100m)
- o Medium distance to dredging centers (CT River: 8 mi; NL: 15 mi)
- o Historic site

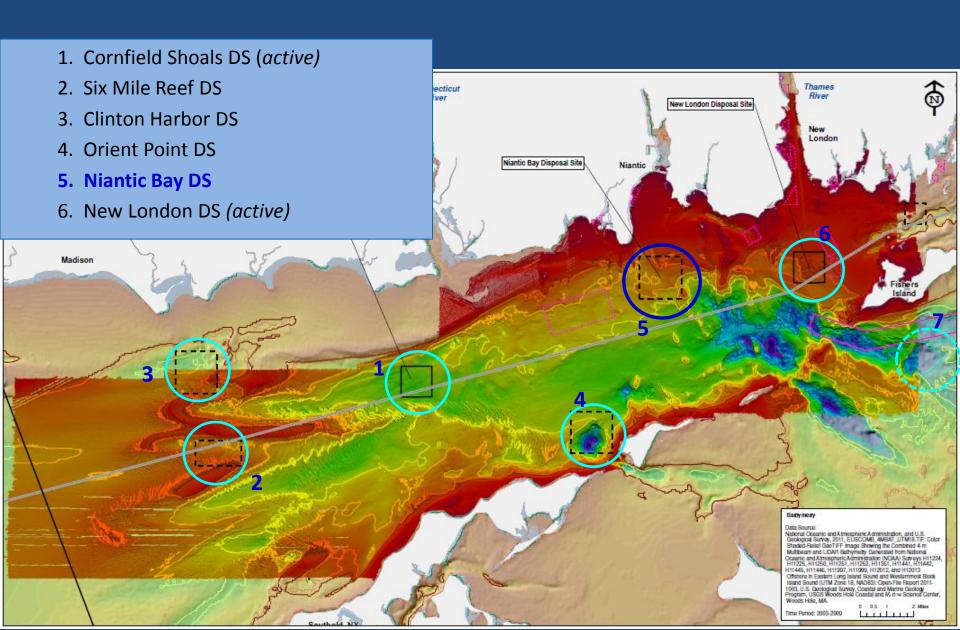
- ? Shellfish resources
- Gravelly sand
- ? Transport into Gardiners Bay (outgoing tide?)
- Navigation (Ferry traffic to Orient Point)





Alternative Site Discussion: Eastern Long Island Sound (cont.)



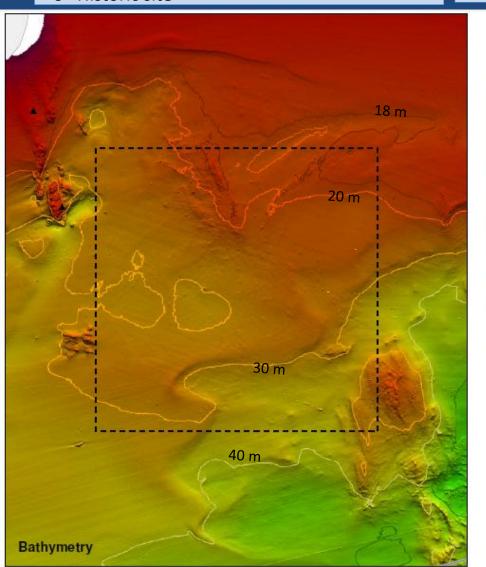


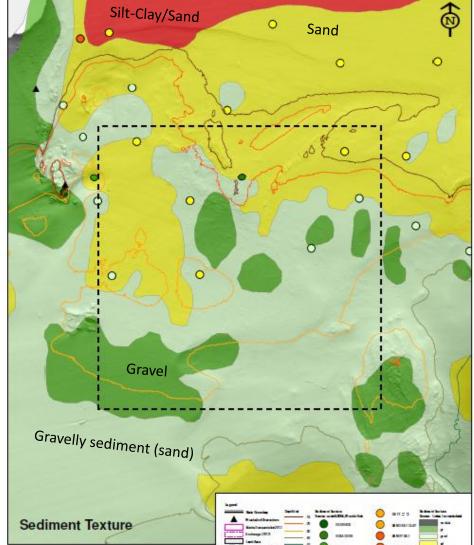
5. Niantic Bay Disposal Site

IL B

- + Deep area (up to 130 ft; 40m)
- + Near dredging centers
- o Outside rocky areas
- o Historic site

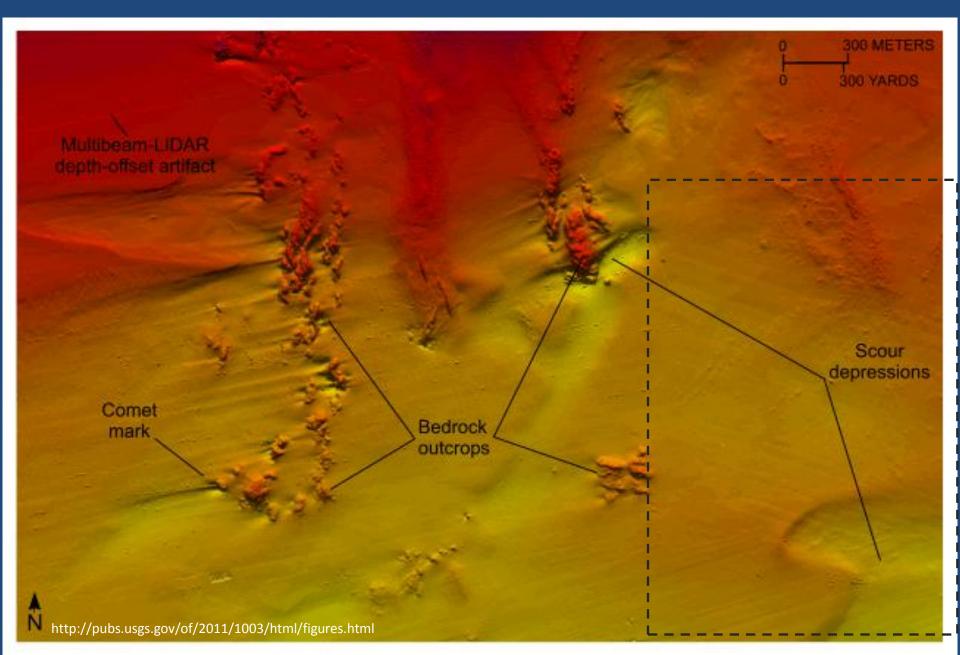
- o Zoned for restricted shellfishing/cond. approved (CT)
- -/? Sand; gravelly sand
- o Transport direction WSW-ENE





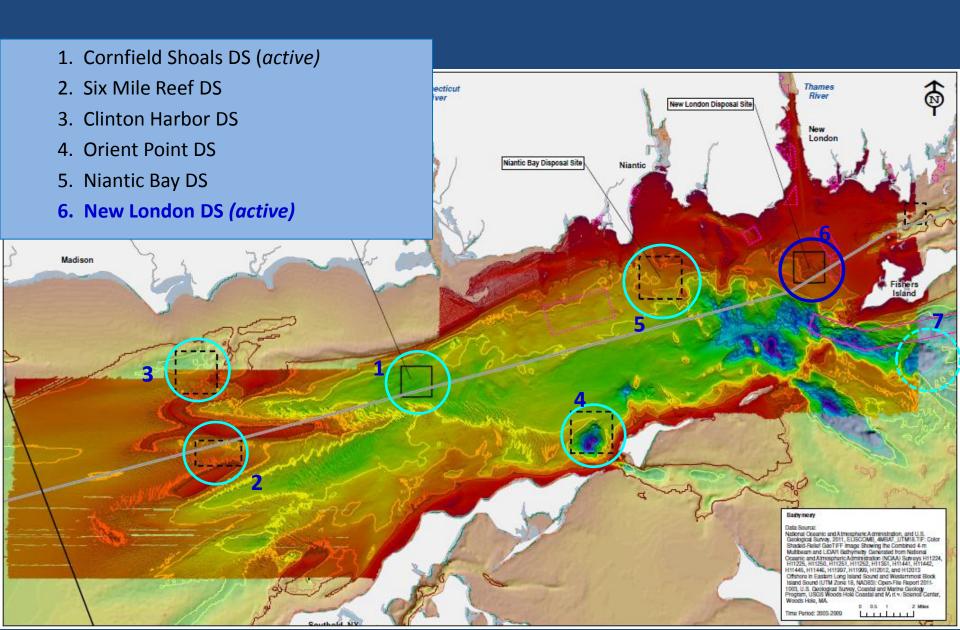
Area around Niantic Bay Disposal Site (Close-up)





Alternative Site Discussion: Eastern Long Island Sound (cont.)

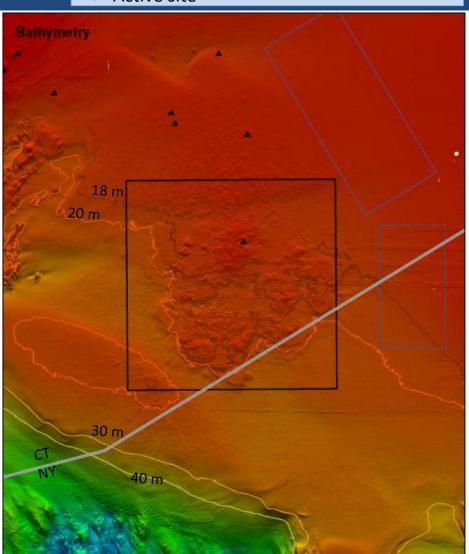




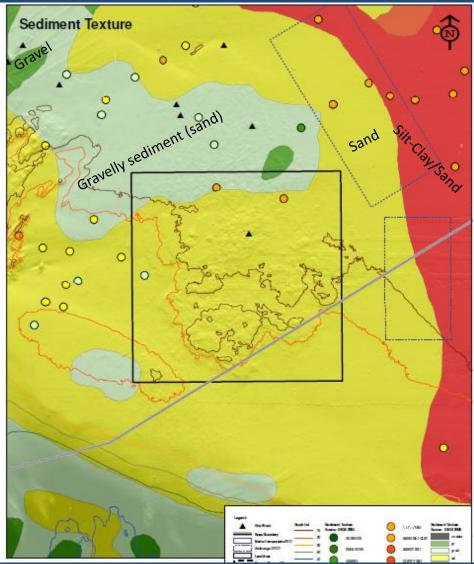
6. New London Disposal Site

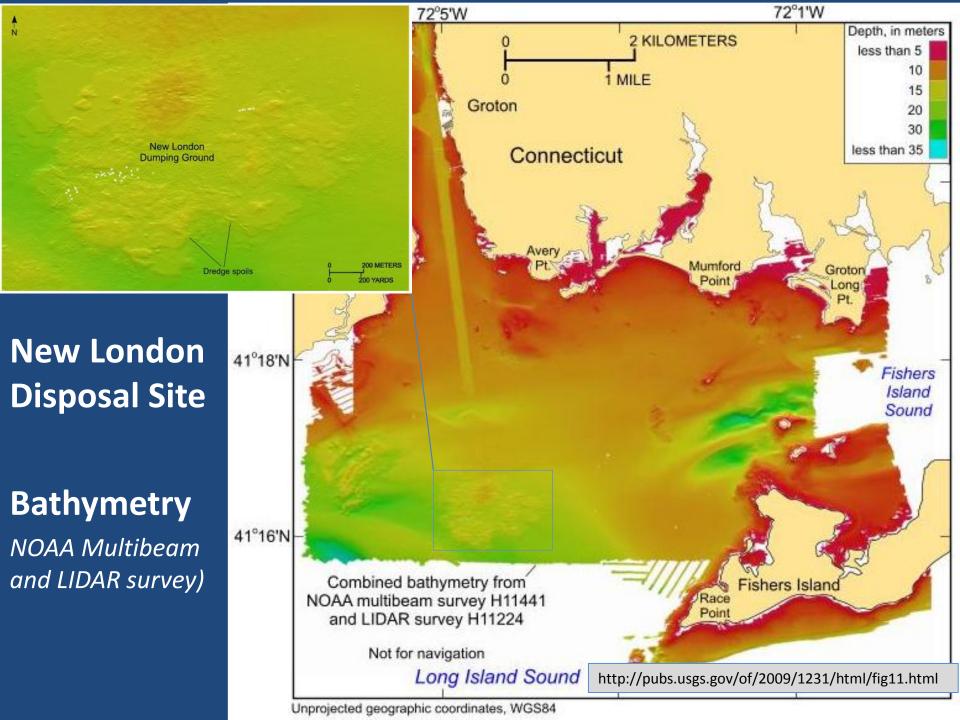
(I)

- -/o Shallow (up to 50-70 ft; 15-21 m)
- + Near dredging centers (NL: 5 nm)
- + Located away from rocky areas
- + Active site



- o Zoned for restricted shellfishing (CT)
- + Fine grained sediment
- Navigation zone
- ? Cable corridor (active cable?)

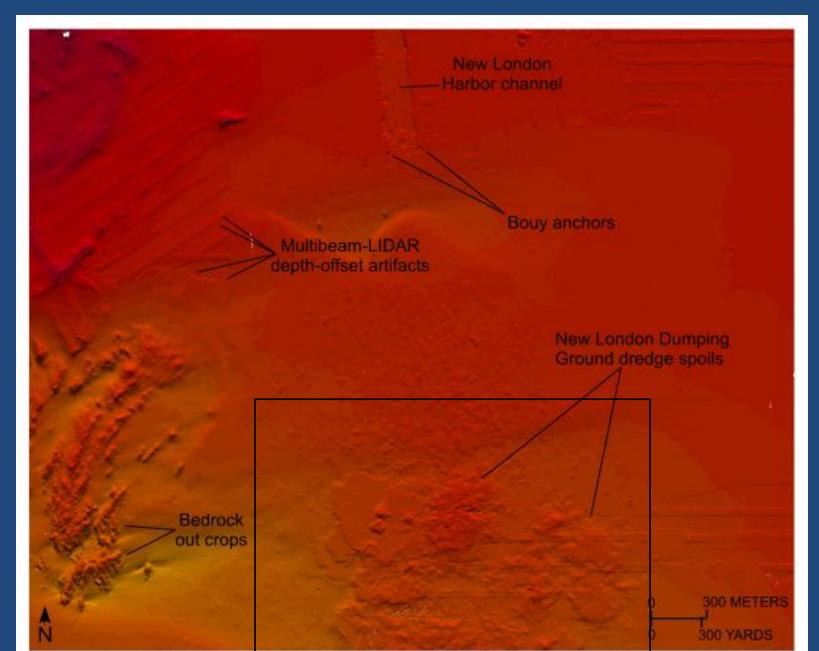




http://pubs.usgs.gov/of/2011/1003/html/figures.html

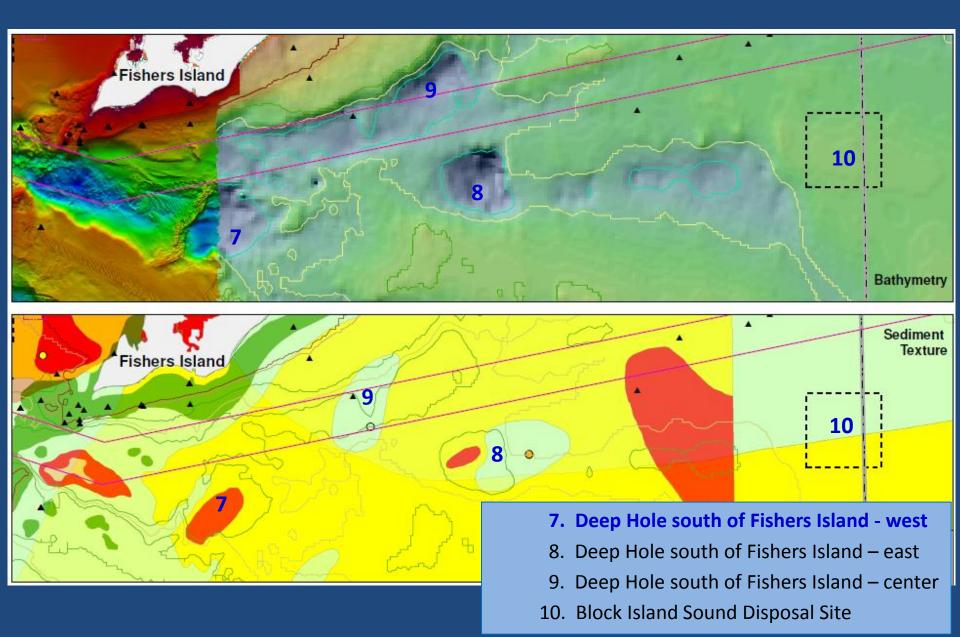
Area around New London DS (close-up)







7-10. Block Island Sound

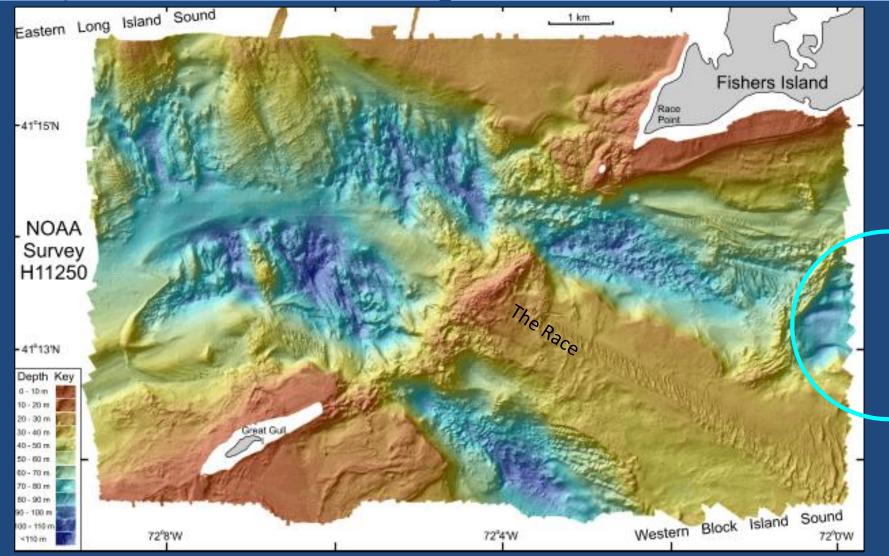


7. Deep Hole south of Fishers Island - west

(i)

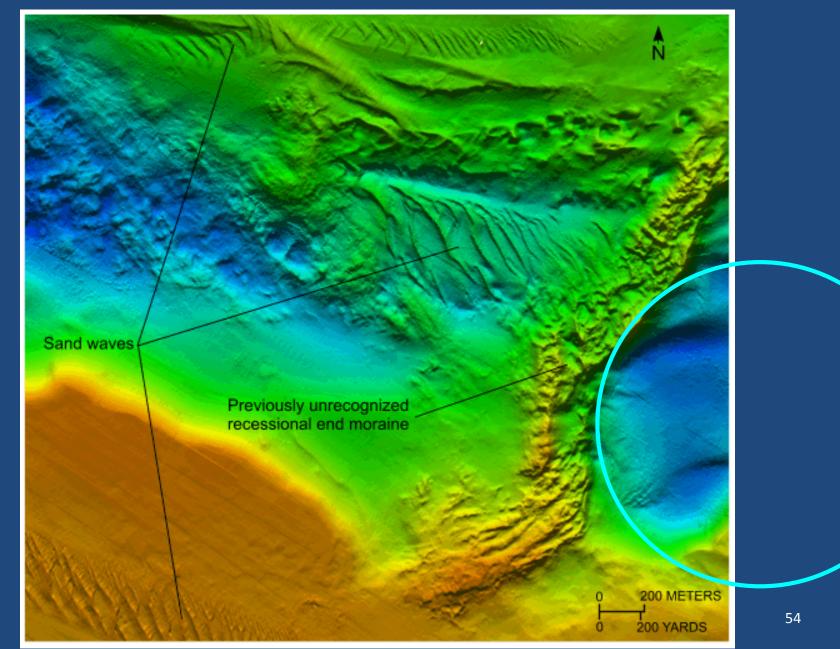
- + Deep depression (270 ft; 90m)
- o Medium distance to dredging centers (NL: 9 nm)
- New site
- o Navigation area

- -/? Dispersive (Silt/clay: likely Pleistocene deposits)
- ? Biological resources
- ? Tidal energy potential



Deep Hole south of Fishers Island – west (close-up)



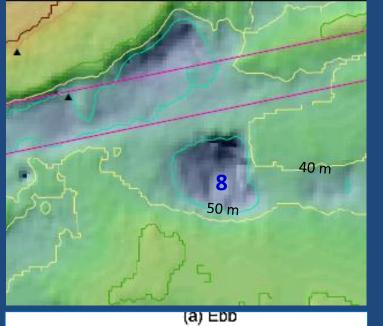


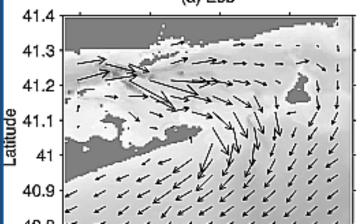
http://pubs.usgs.gov/of/2011/1003/html/figures.html

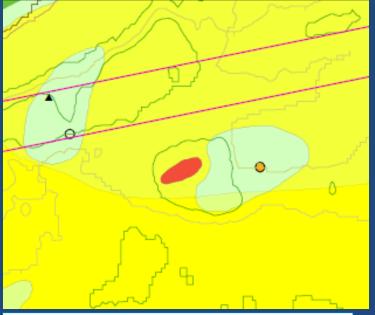
8. Deep Hole south of Fishers Island - east

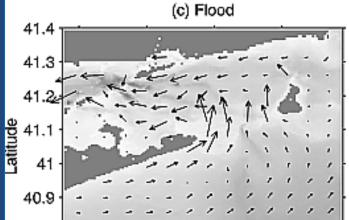
- + Deep depression (325ft; 100m)
- -/o Long distance to dredging centers (NL: 12 mi; CT River: 19 mi)
- New site

- -/? Gravelly sand (silt/clay: Pleistocene deposits?)
- ? Biological resources
- Higher waves in Block Isl. Sound (barge transport)
- Dredge material management (depth/slope)









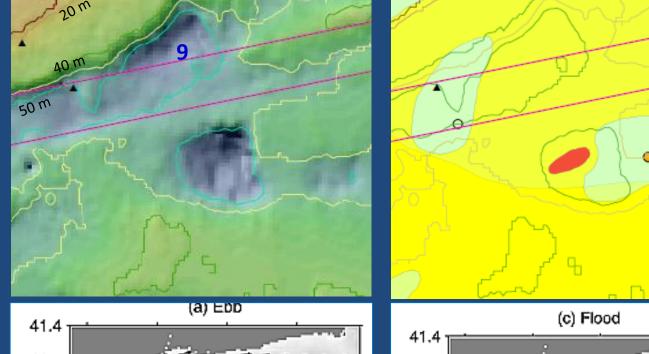


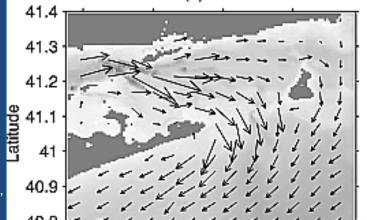
J. Geophys. Res.: Oceans, v. 109, 2004

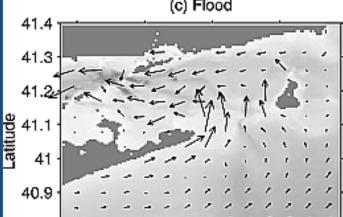
9. Deep Hole south of Fishers Island - center

- + Deep depression (up to 241ft; 80m)
- -/o Long distance to dredging centers (NL: 12 mi; CT River: 19 mi)
- New site

- Sand /gravelly sand
- ? Biological resources
- Higher waves in Block Isl. Sound (barge transport)
- Within recommended navigation zone





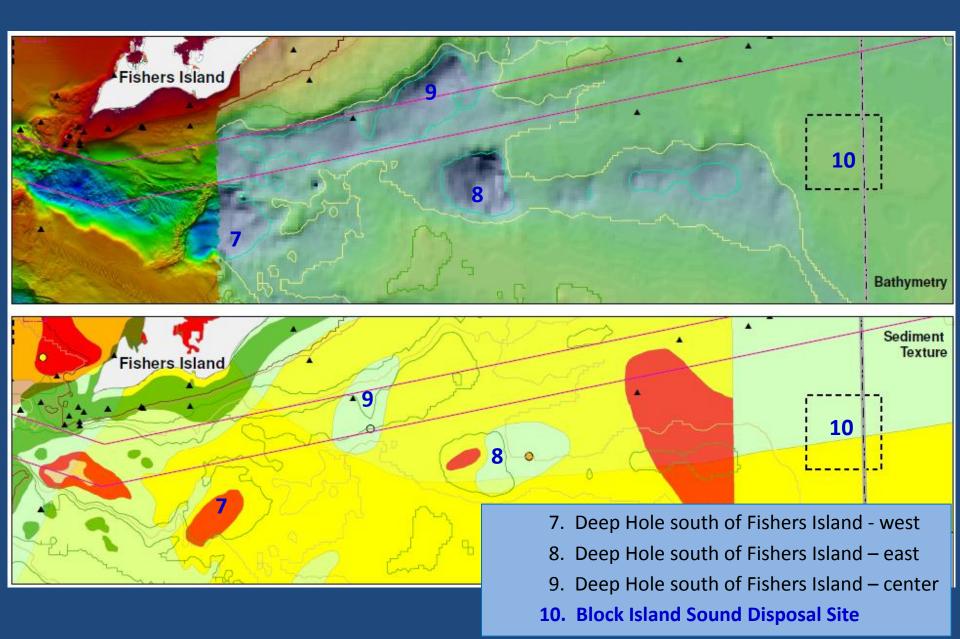




J. Geophys. Res.: Oceans, v. 109, 2004

7-10. Block Island Sound (cont.)





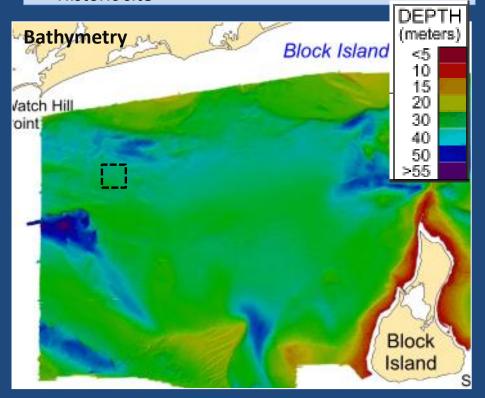
10. Block Island Sound Disposal Site



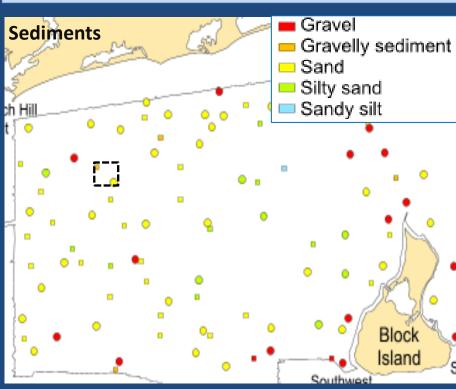
- + Deep (110 ft; 35 m)
- Long distance to dredging centers

(NL: 18nm; CT River: 25 nm)

- Historic site



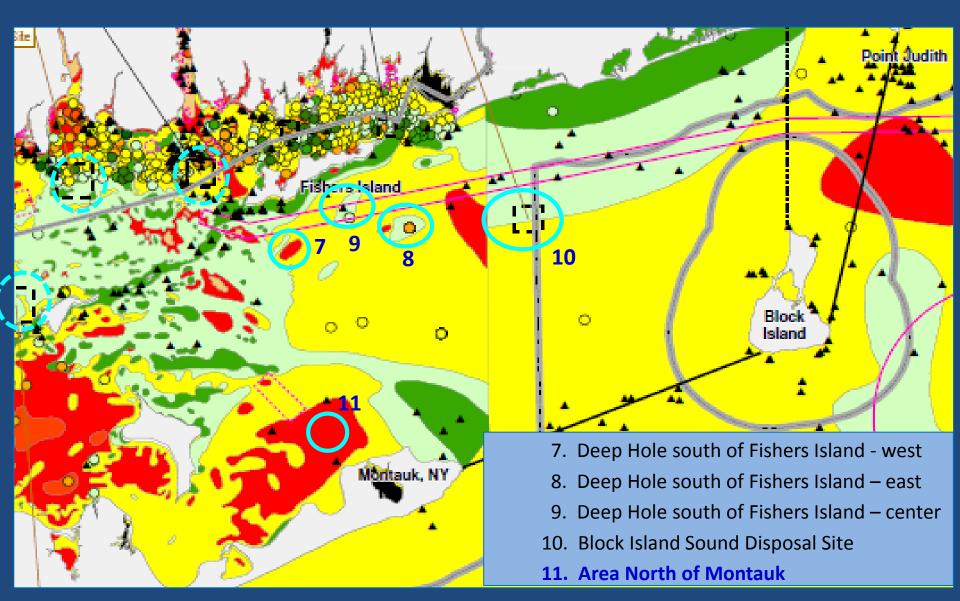




http://pubs.usgs.gov/of/2012/ 1005/html/fig14.html

Alternative Site Discussion: Block Island Sound (cont.)



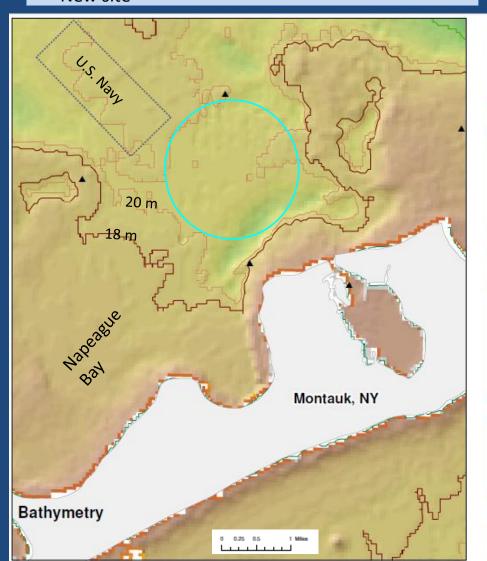


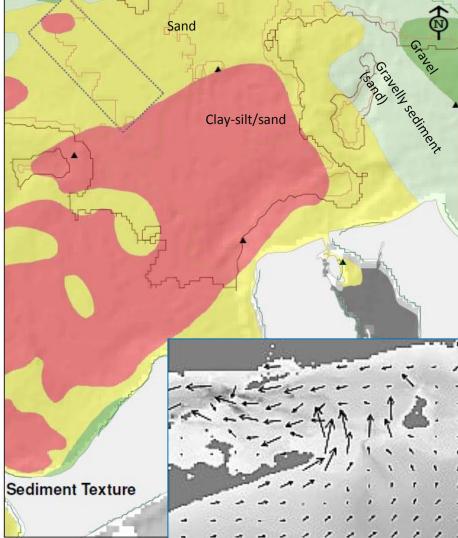
11. Area north of Montauk

(1)

- o Shallow (60-80 ft; 18-24 m)
- Long distance to dredging centers
 - (NL: 16 nm; CT River: 21 nm)
- New site

- o Restricted U.S. Navy submarine anchorage
- +/? Containment (silt-clay/sand)
- ? Biological resources
- Close to shore (beaches; houses)





Alternative Site Discussion – Summary



	Eastern Long Island Sound					Block Island Sound							
	1		2	3	4	5	6	•	7	8	9	10	11
Sites	Cornfield Shoals	Disposal Site	Six Mile Reet Disposal Site	Clinton Harbor Disposal Site	Niantic Bay Disposal Site	Orient Point Disposal Site	New London Disposal Site	Deep Hole south of	Fishers Island - west	Deep Hole south of Fishers Island - east	Deep Hole south of Fishers Island - center	Block Island Sound Disposal Site	Area north of Montauk
Site Characteristics - Depth	+		-	О	+	+	-		+	+	+	0	-
Site Characteristics - Bottom Topography/Sediment Type	-		-	-	-/?	-	+	<u> </u>	-	-/?	-/?	-/?	+/?
Distance to Dredging Centers	+		0	+	+	0	+	(0	-	-	-	-
Active/Historic/New Disposal Site	+		0	0	0	0	+		-	-	-	-	-
Distance to Beaches areas	0		0	0	0	0	0		-	-	-	0	-
Distance to Commercial and Recreational Fisheries	0		o 1	o 1	0	0	0	(0	0	0	0	?
Habitat /Biological Resources	0		o/?	?	0	?	+		?	?	?	?	?
Distance to Shellfish Beds	0		o 1	o 1	0	0	0	(0	0	0	0	?
Distance to existing Habitat /Biological Resources	0		o/?	?	0	?	+	•	?	?	?	?	?
Disposal Site Managem. (mound stability, capacity, sed. type)	0		0	0	0	0	0	(0	0	0	0	0
Historic and Cultural Resources				wrecks									
Navigation Considerations (anchorage, shipping lanes)							2				2		2
Distance to Conservation Area (Marine Sanctuary, preserve)						?						?	?
Other Use Conflicts (cables, pipelines)							cable?						
Other	morphology barge transport - larger waves				a ve s								
Approx. 3 miles east of <i>Approved</i> shellfishing zone. + Relative Advantage o Neutral													

Approx. 3 miles east of *Approved* shellfishing zone.

² Anchorage or vessel lane areas nearby

⁺ Relative Advantage

⁻ Relative Disadvantage

o Neutr

[?] Need more data for screening

Appendix C: Presentation - Physical Oceanography Study Update (James O'Donnell, UConn)



Observation and Model Plans and Status

James O'Donnell
University of Connecticut

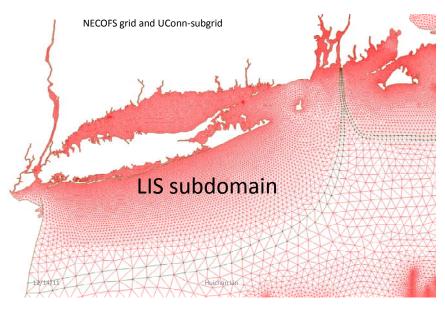
Overview



- 1. Introduction
- 2. Bottom Stress and circulation are central to the site designation process.
 - a) Consideration of all possible sites is only possible if models are used to "interpolate" between the limited location and times data is available using a model.
 - b) Development and evaluation of model requires data.
- 3. Model
- Summary of the data required to predict the range of circulation and bottom stresses expected throughout the ZSF.
- Observation Plan

Model - FVCOM





Outer domain simulated by UMass Operationally through NOAA funding

This is a well established code and has been implemented in LIS already.

It is nested inside the UMass Dartmouth Regional Model.

FVCOM will be used to simulate the circulation and wave height and period distributions, and bottom stress.

Challenges are to get hydrography variability correct in the ZSF domain and wave model implemented and assessed.

Integration of Model and Data

- Use observed winds and river flows to drive model and predict the salinity, temperature, current and waves, and bottom stress.
- Compare to the new and archived observations and evaluate FVCOM performance in LIS.
- Describe the uncertainties.
- Simulate the behavior under extreme events

Analyses

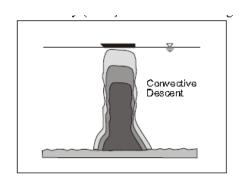


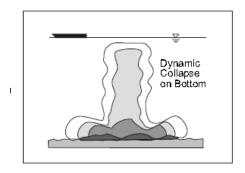
- Observations and model predictions will be used to describe the distributions of current and stress for site screening.
- Uncertainties will be based on model-data comparisons
- When sites are being considered there results will be used to drive the STFATE and LTFATE models.
- Uncertainties will be propagated by mulitple simulations.

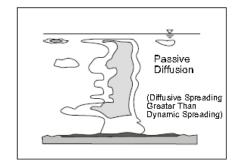
Models STFATE- LTFATE



- STFATE Near field transport during disposal operations
- FVCOM will provide currents, waves and shear for STFATE studies at sites under consideration
- Multiple simulations will define areas of potential impacts







LTFATE



 LTFATE simulates the long term transport of resuspended materials from disposal mound. This requires regional current patterns, and waves forecasts from FVCOM. We will simulate the effects of historic events at alternative sites

2. Summary of data needs – controlling factors.

- Current in the ZSF controlled by tides, density variations and winds.
- 2. Bottom stress if determined by current and waves.
- 3. Waves are generated by wind.
- 4. We want to know the circulation and stress during normal conditions (for each season) and for extreme conditions.
- 5. We can only observe them all for selected interval and at a few places so we need a model to generalize the observations.

3. What is available?



• Three great resources:

- 2. O'Donnell, J., R. E. Wilson, K. Lwiza, M. Whitney, W. F. Bohlen, D. Codiga, T. Fake, D. Fribance, M. Bowman, and J. Varekamp (2013). The Physical Oceanography of Long Island Sound. In Long Island Sound: Prospects for the Urban Sea. Latimer, J.S., Tedesco, M., Swanson, R.L., Yarish, C., Stacey, P., Garza, C. (Eds.), 2013 (Elsievier, In press).
- Codiga, D. L. and David S. Ullman (2010). Characterizing the Physical Oceanography of Coastal Waters Off Rhode Island, Part 1: Literature Review, Available Observations, and A Representative Model Simulation (http://seagrant.gso.uri.edu/oceansamp/pdf/appendix/02-PhysOcPart1-OSAMP-CodigaUllman2010.pdf.)

And our Task 2 report

4. Summary of data needs – variables



- Sea level at the edge of the shelf to force tides and the interior of the model domain to check it.
- 2. Wind over the ocean to force the circulation and waves.
- 3. Solar radiation to force temperature variations.
- 4. River discharge measurements to force variations in salinity.
- 5. Salinity and temperature measurements at boundaries to prescribe conditions and in the interior to check predictions.
- 6. Current measurements to evaluate the model predictions
- 7. Wave measurements to evaluate the model predictions
- 8. Bottom stress measurements to evaluate the model prediction



Salinity & temperature, from Buoys.



S-salinity, **T**-temperature, **DO**-dissolved oxygen (membrane sensor), O-dissolved oxygen (optical sensor), CH-chlorophyll (RFU only)

		CLIS Water		E	LIS water	
Year	SFC	MID	BTM	SFC	MID	BTM
2012	S,T,CH,O					
2011	S,T,CH,O					
2010	S,T,CH,O			S,T,DO		
2009	S,T,CH,O			S,T,DO		
2008	S,T,DO			S,T,DO		
2007	S,T,DO			S,T,DO		
2006	S,T,DO			S,T,DO		
2005	S,T,DO	S,T,DO	S,T,DO	S,T,DO		S,T,DO
2004	S,T,DO	S,T,DO	S,T,DO	S,T,DO		S,T,DO
2003	S,T,DO	S,T,DO	S,T,DO	S,T,DO		S,T,DO
2002	S,T,DO	S,T,DO	S,T,DO	S,T,DO		S,T,DO
2001				S,T,DO		S,T,DO
2000				S,T,DO		S,T,DO
1999				S,T,DO		

Data Gap Summary



- No Stress
- Waves only at CLIS buoy ZSF
- No North-Sound variation in density in LIS
- No hydrography or current profile measurements in BS-RIS
- Seasonal variations in wind & wave and river discharge are substantial.

5. Proposal for Observations



- October-March have frequent high winds from NE
- Wind forcing is less in May-Sept
- River Flow is high Mar-May and below average the rest of the year
- Need current, wave and stress measurement in a range of locations in each forcing regime.
 - Windy, low flow (March + Nov-Dec)
 - Windy High Flow (April-May)
 - Calm, below average flow (June-July)

Station	Latitude (degrees north)	Longitude (degrees west)			
1	41.2000	72.4000			
2	41.1500	72.3700			
3	41.2583	72.2422			
4	41.1500	72.0000			
5	41.1500	71.7500			
6	41.2500	71.8000			
7	41.2600	72.1000			



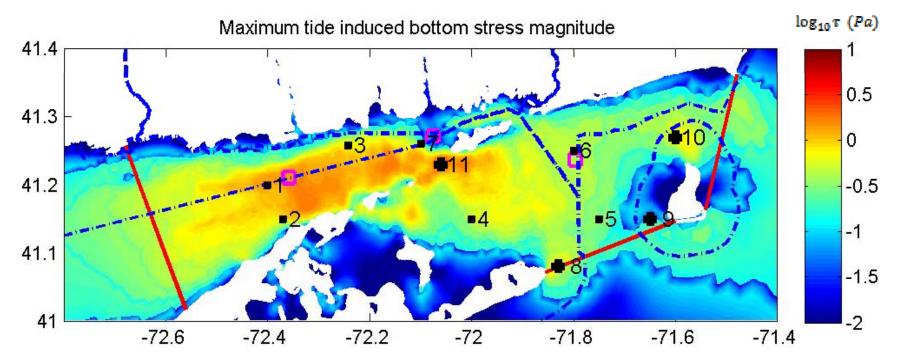
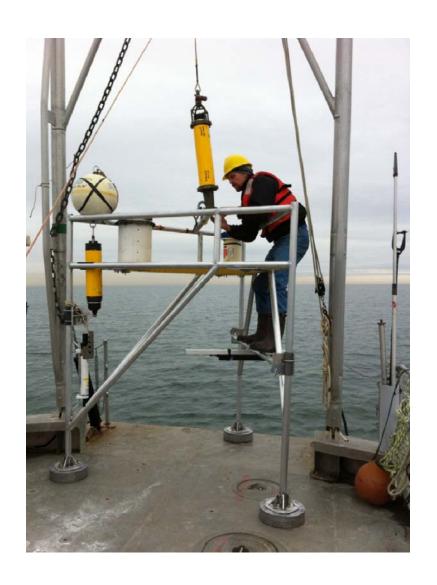


Figure 5. A map of the eastern end of LIS and the Block Island Sound with colors showing preliminary estimates of the distribution of the maximum bottom stress (N/m^2) produced by tidal currents alone. The red lines show the boundaries of the zone of siting feasibility (ZSF). The black squares show the proposed locations of moored current measurements. The open magenta squares indicate the location of existing or historical dredge material disposal sites.



Bottom Instrumentation

- Upward looking RDI ADCP to measure profile (1-0.5m resolution) of current and wave statistics
- 2. Downward looking Nortek ADCP with 5cm resolution bottom to 75cm to measure stress and acoustic backscatter intensity
- 3. CTD to measure salinity, temperature and bottom pressure
- 4. Optical backscatter at .2 and .8 m to infer SPM concentrations



Profiling Instrumentation

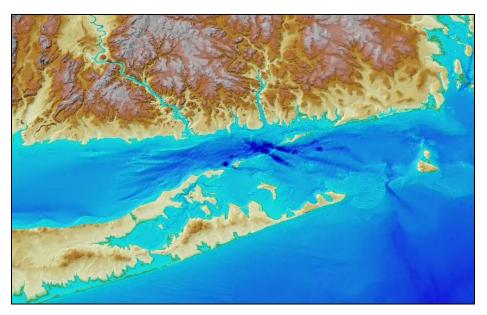
- Hull mounted ADCP to surveyCONN current patterns
- 2. CTD to measure salinity, temperature and pressure
- 3. OBS 3+, optical backscatter to infer SPM concentrations
- 4. Water sampler for SPM concentration calibrations
- 5. LISST-100 to measure particle size spectra
- 6. AC9 Optical absorption spectra for discriminating organic and inorganic material

Appendix A-8

MINUTES OF COOPERATING AGENCY GROUP MEETING 3

Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Sites in Eastern Long Island Sound, Connecticut and New York

Minutes of Cooperating Agency Meeting 3



Prepared for: United States Environmental Protection Agency

Sponsored by: Connecticut Department of Transportation

Prepared by: Louis Berger

with support from

University of Connecticut









June 2013





Eastern Long Island Sound – Supplemental EIS



Cooperating Meeting 03 – Minutes

TOPIC: Site Screening - Second Update

DATE OF MTG: June 18, 2013

LOCATION: Webinar

TIME: 1:30pm to 2:35pm

PARTICIPANTS: Cooperating Agencies

• Connecticut Department of Transportation CTDOT): Joe Salvatore

• US Environmental Protection Agency, Region 1: Jeannie Brochi

• Conn. Dept. of Energy and Environmental Protection: George Wisker

• US Army Corps of Engineers, New England District: Cathy Rogers

Mark Habel Tom Fredette

• US Army Corps of Engineers, New York District: Nancy Brighton

• US Environmental Protection Agency, Region 2: Patricia Pechko

• New York State Department of State: Jim Leary

Kari Gathen Jennifer Street

• New York Department of Environmental Conservation: Charles deQuillfeldt

University of Connecticut (UConn) Project Team (under contract to CTDOT)

• University of Connecticut: James O'Donnell

• The Louis Berger Group, Inc. (*Prepared minutes*): Amy Atamian

Len Warner (at 2:00pm)

SUBMITTED ON: August 5, 2013

The primary goal of the meeting (see agenda in Appendix A) was to review comments made on the presentation of Cooperating Agency Meeting 2 on May 20, 2013, and to discuss the upcoming public meetings.

Specifically, the USEPA received comments from NYSDOS, USACE New England District, and USEPA Region 2 on the initial screening presentation made during Cooperating Agency Meeting 2. Comments and questions pertained to the following issues:

- Commercial and fishing data: More data needed.
- Legend and presentation format (color, font size, etc.)
- The summary sheet was a bit confusing. (It was meant to be a tool to summarize the GIS layers and their use.)
- Tier 1 and 2 screening approach

- 18 meter black-out contour, especially at the New London Disposal Site and the use of sediment texture data.
- Request to add significant fish and coastal wildlife habitat and deepwater coral sites
- Baseline chemical characterization of sediment

Jean Brochi asked if there were additional comments and questions. There were none.

In response to the comments received, revisions were made to Slides 16-18 and 23-27 of the original presentation. Jean Brochi summarized the key changes made; Amy Atamian discussed details. Key changes include the following (revised slides are included in Appendix B):

- Slide 16 Conservation Areas: Deep water corals: Two points were available in the NOAA data base. The New York State significant habitat data layer was added. Some data from Rhode Island for refuges and preserves were added. Local Waterfront Revitalization Plan: Zones were added.
- Slide 17 Shellfish beds: Now shows 2009 shellfish bed locations which include a few beds from the north shore of Long Island. Also now included is 1994 shellfish information for Rhode Island. Additional available data for Gardiners Bay and Peconic Bay (Suffolk County Aquaculture Leasing Program) still needed to be added.
 - Amy Atamian asked about any additional available data for New York's north shore of Long Island Sound (LIS). Charles deQuillfeldt stated that any active leases in Long Island Sound are west of the Eastern Long Island Sound (ELIS) study area (Debbie Barnes from NYSDEC may have some information; 631-444-0483). He also stated that no surveys are available (as far as he knows) that show locations of shellfish beds.
- Slide 18 Fishing Area: Relevant information on fishing areas for New York and Connecticut waters is still lacking.
 - Charles deQuillfeldt mentioned that NYSDEC does not have spatial information either; commercial harvesters may have some information. A question was asked if this data could be obtained from the Atlantic States Marine Fisheries Commission (ASMFC) or the Fishery Management Council. Charles deQuillfeldt stated that this is unlikely but he will check into it. A lot of the commercial harvesters cannot use nets in Long Island Sound. Amy Atamian stated that there was an area east of Gardiners Island that was classified for multiple use commercial fishing. Charles deQuillfeldt stated that this area would not extend eastwards beyond a line from Orient Point (or Plum Island) to Montauk, as Suffolk County does not have leasing rights in Block Island Sound (BIS).
- Slide 23 Approved/ Prohibited Shellfish Areas: The Rhode Island data set was updated with 2013 data that were recently posted on the web. Also, now shows areas in Gardiners and Peconic Bay that are part of the leasing program.
 - Charles deQuillfeldt stated that information on closed shellfishing areas for New York State is available in 6NYCRR Part 41 which has maps of approved and prohibited shellfishing areas. He also stated that some prohibited locations were missing on the slide, such as one at Plum Island and another one by Greenport around the sewage treatment plant outfall. He further stated that the regulations only list permanent closures, not temporary closures.
- Slide 24 Active and historic disposal sites: The Rhode Island Sound disposal site was updated to 'active'.

- Slide 25 Archaeological and cultural resources: The previously used data set from the Northeast Ocean Data Portal was updated to the current NOAA's Automated Wreck and Obstruction Information System (AWOIS). Data from the archaeological study performed in 2010 for the DMMP are not included as the study was only in nearshore areas and GIS data are not available.
- Slide 26 Recreational areas and navigation: Parks and beach locations were added from a DMMP study. Amy Atamian will check on the data for the New York State data layer for parks. Charles deQuillfeldt suggested adding the Long Island Sound Stewardship sites to this slide, available from the Long Island Sound Study website. Jennifer Street stated that she will provide information on municipal, county-level park areas (including beaches) to be added.
- Slide 27- Overlay 1 Base Bathymetry: Not yet updated. NOAA archaeological data need to be checked.

Jean Brochi then discussed a draft of the presentation and the agenda for the Public Meetings on June 25 (NY) and 26 (CT): Bernward Hay will start the meeting. Jean Brochi will give a project update, followed by site screening overview. Then the meeting will be opened up for discussion and next steps. Comments will not be specifically requested as it is an informational meeting.

Jean Brochi then reviewed the draft presentation¹ for the meeting. Key elements of the presentation consisted of the following:

- Overview of applicable regulations for dredged material disposal
- EPA's role in dredging and dredged material management
- Reminder of the active dredged material disposal sites
- History leading up to the SEIS
- Zone of Siting Feasibility, focused on ELIS
- Update on activities (Notice of Intent; comments received; public scoping document; data gap analysis and literature search is ongoing; physical oceanography study is ongoing; initial screening of sites from January to June; additional screening with data collection from June through August; etc.)
- Approach to screening: Tier 1 and Tier 2 will be confusing, thus the approach will focus instead on MPRSA criteria. The evaluation will include GIS layers and data located through the literature search.
- Examples of screening criteria (based on MPRSA)
- Would like to share that there are six areas in ELIS and five areas in BIS that could be considered for potential disposal sites.
- Plans to ask the Public for any additional existing information or data, if known.
- Discussion of historic sites, as documented by the USACE.
- Bathymetry for ZSF.

Kari Gathen asked about the difference between a cable area and a submarine cable. Amy Atamian stated that 'cable areas' are areas delineated on the NOAA charts and they could be 500 feet on either side of the actual cables location within these areas; submarine cables are also shown as linear features like that on the NOAA charts.

Tom Fredette asked about the alignment of a submarine cable crossing the Rhode Island Sound Disposal Site. Amy Atamian stated she would review the adequacy of the spatial resolution on the original data layer.

¹ Note: The final version of the presentation is available in the Public Scoping Meeting Report for the meetings.

A comment was made about being more consistent with the color palette throughout the various slides.

Jean Brochi then asked if there were any objections to using the slide with the dredging centers in the public meeting presentation. There were none. Mark Habel suggested editing the 25-mile circles.

Jean Brochi listed 'next steps' to include the following:

- Focus on additional data to fill data gaps, especially for sediment, biological resources, and fisheries
- Gather additional cultural resources data
- Conduct the physical oceanography study with preliminary data to be presented at another Cooperating Agency meeting in late summer or early fall
- Focus current data collection efforts on priority areas in the ELIS around the active sites, but also continue efforts to locate more data for other sites
- Hold another public meeting in late fall (perhaps late October or November) and congressional meetings and briefings.

Jean Brochi asked for suggestions of other information that should be presented. There were none. She stated that the final agenda and presentation would be provided to the Cooperating Agency members prior to the public meetings.

Jean Brochi also anticipates the following upcoming requests for input by the Cooperating Agencies:

- In 2005, the EPA sent out a lobster survey to lobster fishermen. Some of the questions could be asked differently or converted into a multiple-choice format. Input will be sought also from the USACE about lessons learned during some of the surveys conducted for the DMMP.
- Review of preliminary data from the physical oceanography study.

Jean Brochi will also be reaching out to tribes to obtain relevant information.

The meeting was adjourned at approximately 2:35pm.

APPENDICES

Appendix A: Invitation and Agenda (Jeannie Brochi, USEPA)

From: Brochi, Jean [mailto:Brochi.Jean@epa.gov]

Sent: Friday, June 14, 2013 2:14 PM

To: Pechko, Patricia; Pabst, Douglas; Grimaldi, Alicia; Cote, Mel; Hamjian, Lynne; Hay, Bernward; O'donnell, James (james.odonnell@uconn.edu); Atamian, Amy; Bohlen, Walter (walter.bohlen@uconn.edu); Jennifer.Street@dos.ny.gov; dgoulet@crmc.ri.gov; jwillis@crmc.ri.gov; george.wisker@ct.gov; joseph.salvatore@ct.gov; mark.l.habel@usace.army.mil; Herter, Jeff (DOS); Nancy.J.Brighton@usace.army.mil; Catherine.J.Rogers@usace.army.mil; Lou.chiarella@NOAA.gov; diane.rusanowsky@noaa.gov; dxmcreyn@gw.dec.state.ny.us; Benjamin.J.Duarte@uscg.mil

Cc: kari.gathen@dos.ny.gov; james.leary@dos.ny.gov **Subject:** LIS SEIS COOPERATING AGENCY MEETING #3

Hello,

This is a reminder that EPA is hosting a Cooperating Agency Webinar next Tuesday, June 18^{th} from 1:30-3:30pm

- 1) Agenda (also see attached)/to be discussed:
 - comments from Cooperating agencies on May 20th presentation
 - changes made to the May 20th presentation
 - the presentation for the public meeting
 - the agenda for the public meeting
 - logistics for the public meeting
- 2) Link to Webinar: Meeting Name: LIS SEIS COOPERATING AGENCY MEETING #3 Invited By: Jean Brochi (Brochi.Jean@epa.gov)

When: 06/18/2013 1:30 PM - 3:30 PM

To join the meeting:

https://epa.connectsolutions.com/r10ifmi57ix/

3) Audio Conference: Dial-In Number: (617)918-2822, Password: 255664

Please feel free to contact me if you have any questions. Regards, Jeannie



June 18, 2013 – EPA Webinar -ELIS SEIS Cooperating Agency Meeting #3

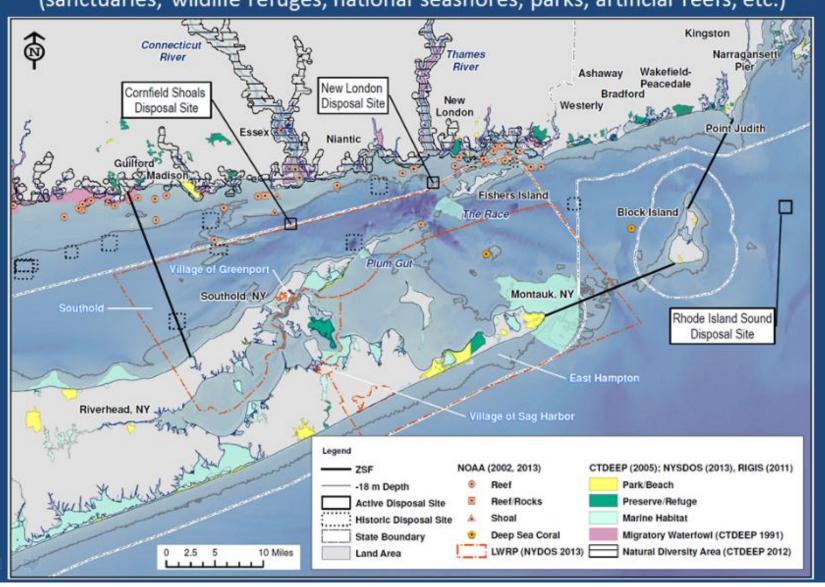
Agenda

1:30 pm	Introductions/Objectives Jean Brochi, EPA
1:35 pm	Comments from Cooperating Agencies on the May 20 th Screening presentation Jean Brochi, EPA
1:45 pm	Revisions to the May 20 th Screening presentation Jean Brochi, EPA and Amy Atamian, LBG
2:00 pm	Agenda for the upcoming public meetings
2:05 pm	Review the presentation for the public meetings
2:30 pm	Next Steps – logistics for public meetings and other comments or discussion points
3:30 pm	Adjourn

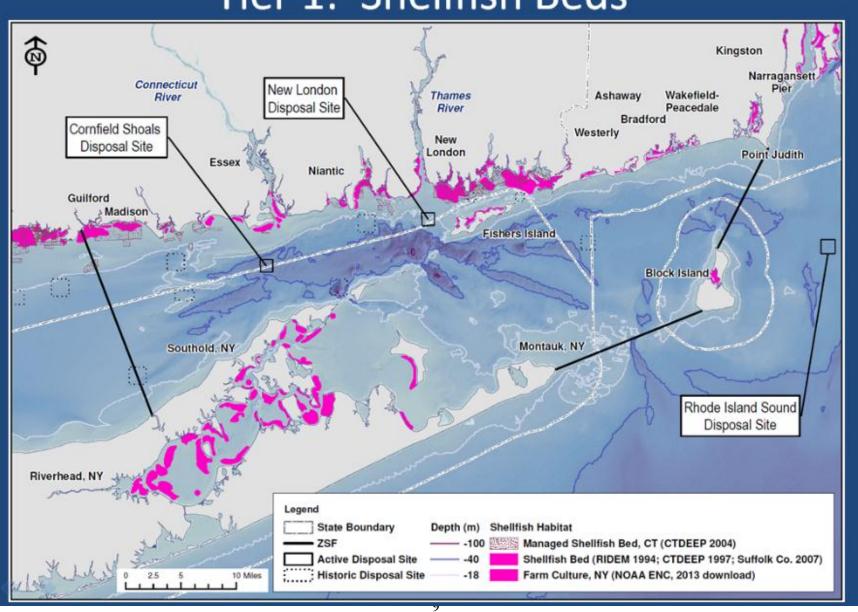
Appendix B: Updated Site Screening Slides (Amy Atamian, The Louis Berger Group, Inc.)

Conservation Areas

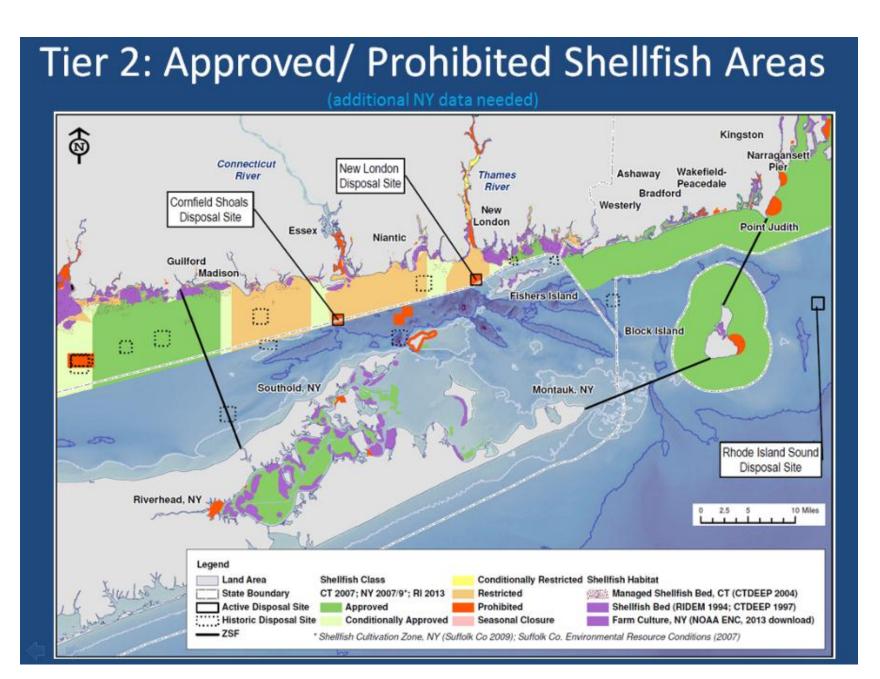
(sanctuaries, wildlife refuges, national seashores, parks, artificial reefs, etc.)



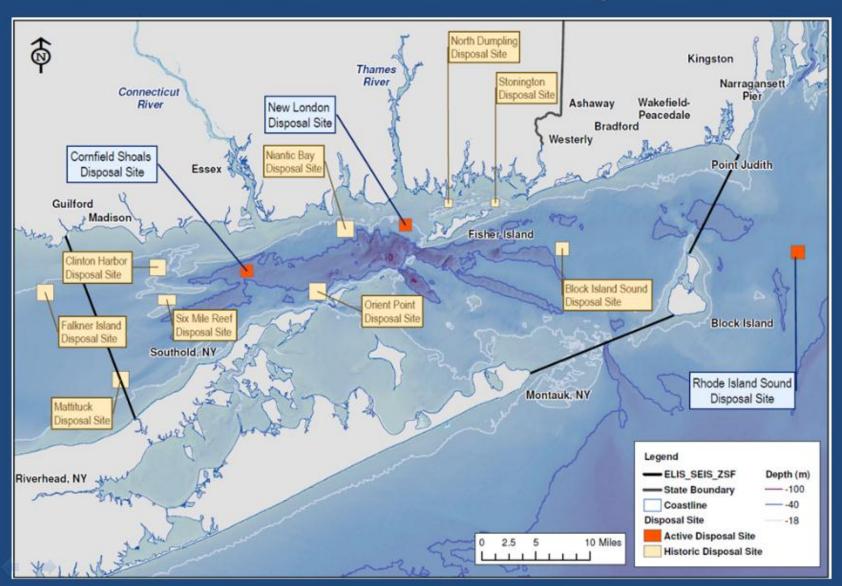
Tier 1: Shellfish Beds



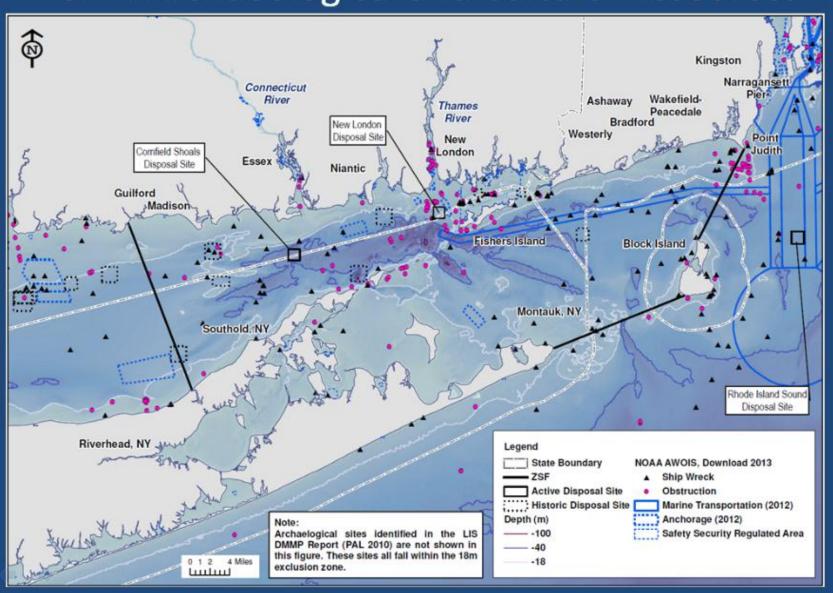
Tier 1: Fishing Areas (additional data needed) Kingston Thames River Narragansett Connecticut New London Wakefield-Ashaway River Disposal Site Peacedale Bradford Cornfield Shoals Westerly New Disposal Site London Point Judith Essex Niantic Guilford Fishers Island Madison The Race Block Island Plum Gut Southold, NY Montauk, NY Rhode Island Sound Disposal Site Riverhead, NY Legend RI Fishing Areas (2009) ZSF **Active Disposal Site** Commercial, Mobile **Historic Disposal Site** Commercial. Fixed **Land Area** Recreational State Boundary 10 Miles



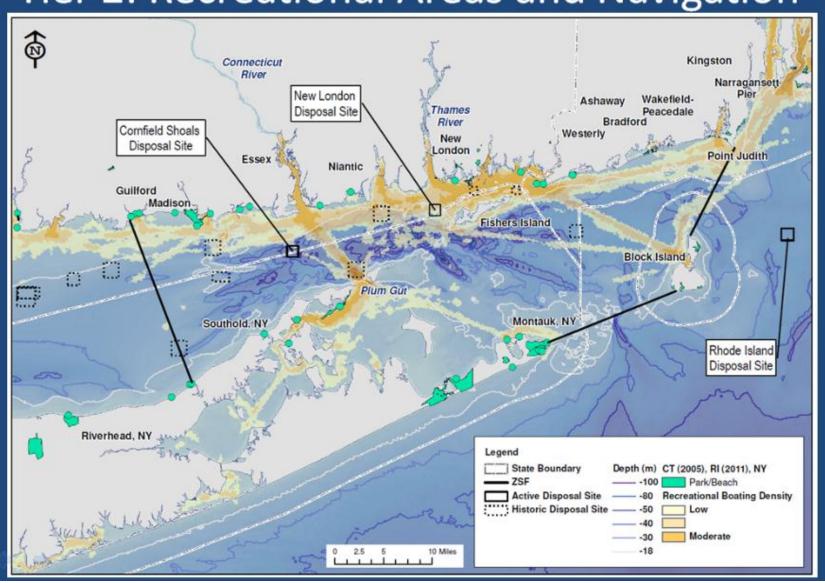
Tier 2: Active and Historic Disposal Sites

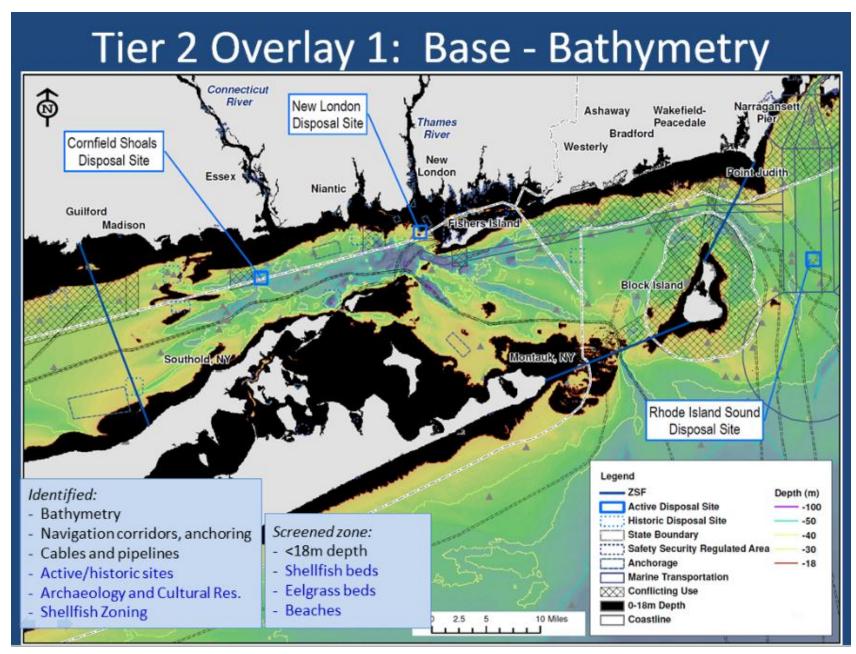


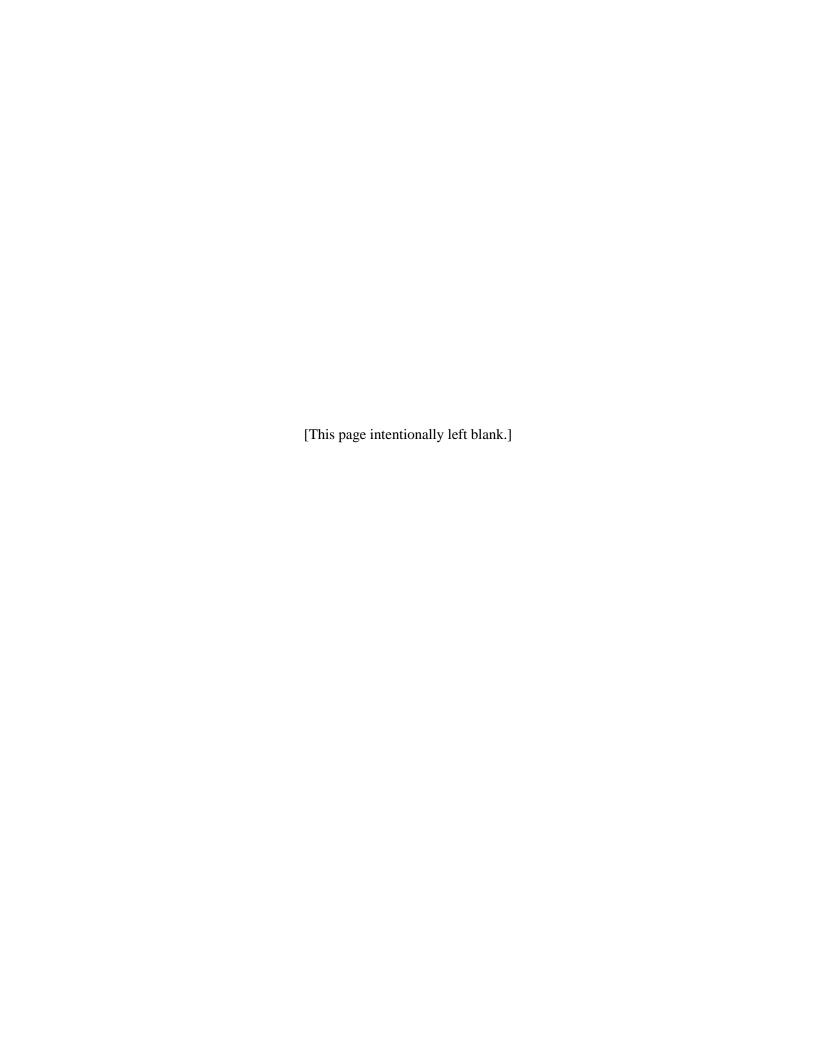
Tier 2: Archaeological and Cultural Resources



Tier 2: Recreational Areas and Navigation





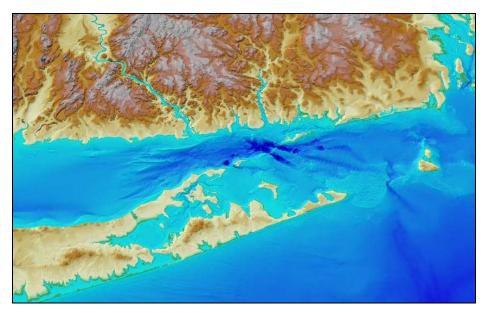


Appendix A-9

MINUTES OF COOPERATING AGENCY GROUP MEETING 4

Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Sites in Eastern Long Island Sound, Connecticut and New York

Minutes of **Cooperating Agency Meeting 4**



United States Environmental Protection Agency Prepared for:

Sponsored by: Connecticut Department of Transportation

Louis Berger Prepared by:

with support from

University of Connecticut









September 2014





Eastern Long Island Sound – Supplemental EIS



Cooperating Meeting 04 – Minutes

TOPIC: Physical Oceanography Study

DATE OF MTG: September 5, 2014

LOCATION: Webinar

TIME: 10:00am to 11:15am
PARTICIPANTS: Cooperating Agencies

Connecticut Department of Transportation CTDOT): Joe Salvatore
 US Environmental Protection Agency, Region 1: Jeannie Brochi
 US Army Corps of Engineers, New England District: Todd Randall
 US Environmental Protection Agency, Region 2: Patricia Pechko

• New York State Department of State: Kari Gathen

Liz Podowski Jennifer Street

Michael Zimmerman

• New York Department of Environmental Conservation: Charles deQuillfeldt

Dawn McReynolds

University of Connecticut (UCONN) Project Team (under contract to CTDOT)

• University of Connecticut: James O'Donnell

• Louis Berger (*Prepared minutes*): Bernward Hay

SUBMITTED ON: September 11, 2014

The purpose of the meeting was to present the results of Physical Oceanography (PO) Study in preparation for the Eastern Long Island Sound (ELIS) region Supplemental Environmental Impact Statement (SEIS). The study was conducted by the University of Connecticut (UCONN) with support from Louis Berger; it was prepared for the U.S. Environmental Protection Agency (USEPA), and sponsored by the Connecticut Department of Transportation (CTDOT).

Jean Brochi introduced the meeting, stating that the presentation will be a summary of what is available in both the PO Field Data Report and the Model Report which was distributed to the Cooperating Agencies on August 22, 2014. She asked that clarifying questions on the reports or presentation could be asked at the end of the presentation. Written comments or questions could also be sent to her after review of documents. Charles deQuillfeldt stated that the Field Data Report could not be downloaded as NYSDEC's computer system currently has problems. Jean Brochi stated that would send a CD with the report.

James O'Donnell then presented the details of the study, consisting of the following components:

- Objective of the PO study
- Model overview

- Model calibration
- Evaluation of model simulations
- Analysis of results
- Summary of findings

The presentation is attached in Appendix 1: it followed the Field Data Report and Modeling Report prepared for this study (please refer to the appendix and the reports for details).

Questions after the presentation were as follows:

• Dawn McReynolds asked about the data recovery for currents and suspended sediment near the seafloor at the seven moored stations, which collected half or less data of the data targeted (*Slide 10 in Appendix 1*). She asked if the data recovered were sufficient to guarantee the 90% variance of the model.

James O'Donnell responded that he needed a minimum of 75 days of data at each station for the model; this was achieved by the field program. During Campaign 1 (spring), the data return was lower compared to other campaigns, with Station DOT3 achieving less than 25 days of data. However, there is no degradation in the model because of that. The available data was sufficient to discriminate areas of high and low stress. The field program captured several storms; more than three in eastern Long Island Sound and more than two in Block Island Sound. This outcome is better than expected. Normally instruments deployed in these waters are even more affected by fishing activities than what was experienced during this study. Some instrument loss was anticipated when the field program was designed.

• Patricia Pechko asked if the conditions during the three campaigns (spring, summer, winter) were typical for these seasons.

James O'Donnell stated that he considers them 'typical'. The study captured a fairly wide sample of conditions. In fact, the study observed that the *maximum* bottom stresses that occurred during the three seasons did not differ all that much. In other words, winter storms may have similar wind speeds as summer storms, although the frequency of storms may be less in the summer. However, due to the length of the field program, several good summer storms were captured.

• Michael Zimmerman inquired about the correlation between predicted and observed data which were very strong (*Slide 20 in Appendix 1*), asking if a standard error was determined and model results were adjusted accordingly.

James O'Donnell responded that there were no adjustments to the data or the model as they are independent.

Michael followed up asking if the difference between the model and the field data was considered in the subsequent modeling.

James O'Donnell responded the correlation between model and field data was not used to adjust any model results.

 Patricia Pechko asked if Superstorm Sandy was a worst-case scenario, or if one of the more recent hurricanes would be a better example for worst-case conditions. In other words, why was Sandy selected as a worst-case storm?

James O'Donnell responded that a 100-year long record of bottom stress or currents does not exist which would allow evaluating the severity of conditions during Sandy; in addition, there were no current velocity measurements during Sandy either. However, data are available for sea level and wind speeds (*Slides 27 and 28 in Appendix 1*) that allow an assessment of the severity

of Sandy. The maximum sea level correlates with the maximum current velocities during a storm. In New London, the return period of sea level rise as a result of storm surge (based on a record of 70 years) is approximately 2 meters (m) (*Slide 29 in Appendix 1*). The peak surge in New London during Sandy was 2 m (*Slide 28*), thus implying that it can be considered a 100-year storm.

James O'Donnell did the same analysis for Hurricane Irene which had a storm surge of 1.6 m, making it approximately a 20-year storm. While the impacts from hurricanes may be greater economically, current velocities in Long Island Sound are affected by storm surge. Part of the reason for the high storm surge in Long Island Sound during Sandy was not maximum wind speed (Sandy dropped to a' tropical storm' category), but rather the fact that the still high wind speeds during Sandy lasted for several days pushing the sea level continuously higher and resulting in severe flooding in the western part of Long Island Sound. After the storm, all the water accumulated in the Sound flowed out in the eastern part of the Sound.

Jean Brochi stated that the estimated schedule for the Draft SEIS at this time is December 2014 or January 2015. However, she stated further that there was a request during the last Cooperating Agency meeting to allow for more time for review of documents, which EPA will accommodate for future documents with a minimum of three weeks.

The webinar was adjourned at approximately 11:15am.

APPENDIX 1: Presentation by Dr. James O'Donnell (University of Connecticut): Physical Oceanography of Eastern Long Island Sound Region

Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Site(s) in Eastern Long Island Sound, Connecticut and New York

Physical Oceanography of Eastern Long Island Sound Region



Prepared for: U.S. Environmental Protection Agency



Sponsored by: Connecticut Department of Transportation



Prepared by: University of Connecticut



with support from: Louis Berger



Cooperating Agency Meeting 4 (Sept. 5, 2014)

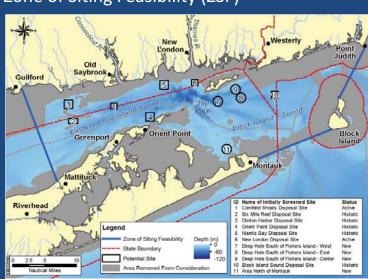


Objective of PO Study



Support evaluation and selection of potential dredged material disposal sites within the Zone of Siting Feasibility (ZSF)

- Describe distribution of maximum bottom stress magnitudes expected in the ZSF including 'Superstorm Sandy' conditions (a 100-year storm)
- Characterize circulation in the ZSF to support assessment of potential off-site effects
- Acquire physical oceanography data to support future modeling of sediment transport at potential dredged material disposal sites



Zone of Siting Feasibility (ZSF). Initial screening identified (1) areas not suitable for locating dredged material disposal sites due to various constraints (gray zone), and (2) 11 sites for further investigation as potential disposal sites; these sites include two active and five historic disposal sites, and six 'new' sites not previously used for dredged material disposal. The background represents water depth.





Outline

1. Model: Configure and test

2. Calibration: Use available data

3. Evaluation of Simulations

- Field Program: Collect data (currents and stress etc.) at a set of stations that are expected to exhibit a wide range of conditions

- Model Performance: Evaluate predictions of model with new data

- 4. Analysis
- 5. Summary



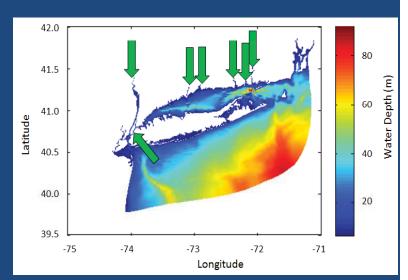




FVCOM:

- Forced by Tides and NECOFS
- Observed River flow and wind
- Climatology for surface heat exchange
- Climatology for initial conditions

1. Model



Bathymetry of the LIS model subdomain with the locations of freshwater sources (green arrows; from left to right: Hudson River, New York City wastewater treatment plants, Housatonic River, Quinnipiac River, Connecticut River, Niantic River, and Thames River).





1. Model (cont.)

An Unstructured Grid, Finite-Volume, Three-Dimensional, Primitive Equations Ocean Model: Application to Coastal Ocean and Estuaries

Changsheng Chen and Hedong Liu

School for Marine Science and Technology, University of Massachusetts-Dartmouth, New Bedford, Massachusetts

ROBERT C. BEARDSLEY

Department of Physical Oceanography, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts

Conservation of Momentum: Reynolds Average Navier- Stokes Equation

$$\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} + w \frac{\partial u}{\partial z} - f v$$

$$= -\frac{1}{\rho_o} \frac{\partial P}{\partial x} + \frac{\partial}{\partial z} \left(K_m \frac{\partial u}{\partial z} \right) + F_u,$$

At the seafloor

$$K_{m}\left(\frac{\partial u}{\partial z}, \frac{\partial v}{\partial z}\right) = \frac{1}{\rho_{o}}(\tau_{bx}, \tau_{by}),$$

where the stress is parameterized as

$$(\tau_{bx}, \tau_{by}) = C_d \sqrt{u^2 + v^2}(u, v)$$

and the drag coefficient is written in terms of the roughness at the seafloor as

$$C_d = \max \left[\frac{k^2}{\ln \left(\frac{z_{ab}}{z} \right)^2}, 0.0025 \right],$$
 (2.14)

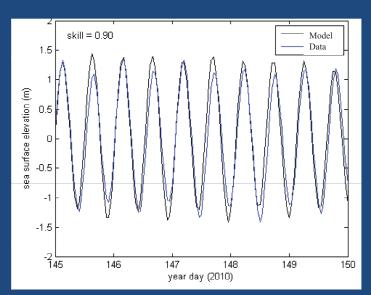
where k=0.4 is the von Kármán's constant and z_{\circ} is the bottom roughness parameter.



2. Calibration



- Set z₀ =0.001 m to optimize the simulation of the sea level at Bridgeport for 2010
- Determine the Skill (variance in data explained/variance in data) to be 90%



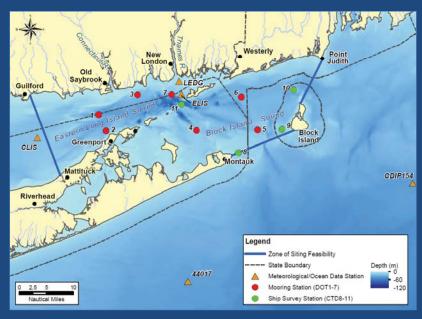
Comparison of tidal heights at the NOAA Bridgeport tidal height gauge (BDR, blue) compared to those predicted by the FVCOM model (black) after iteratively calibrating the model using the 2010 NOAA data. Note that year day 1 is January 1, 2010.



3. Evaluation – Field Program



- Deploy instruments on 7 bottom tripods for 3 two-month observation campaigns to observe spring, fall and winter
- Conduct 6 cruises
 with water column
 measurements at the
 7 tripod stations and
 4 additional stations



Survey stations in the ZSF, as well as meteorological/ocean stations. The background represents water depth.



3. Evaluation – Field Program (cont.)



- Upward looking RDI ADCP for water column currents and waves
- Downward looking Nortek ADCP for stress
- 2 optical backscatter (OBS3+) for suspended sediment concentration
- SeaBird CTD (SBE SMP37) for salinity and temperature





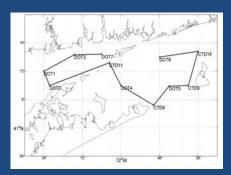
Left: Location of instruments in moored tripod frame Right: Close-up of the OBS3+ mounts





3. Evaluation – Field Program (cont.)

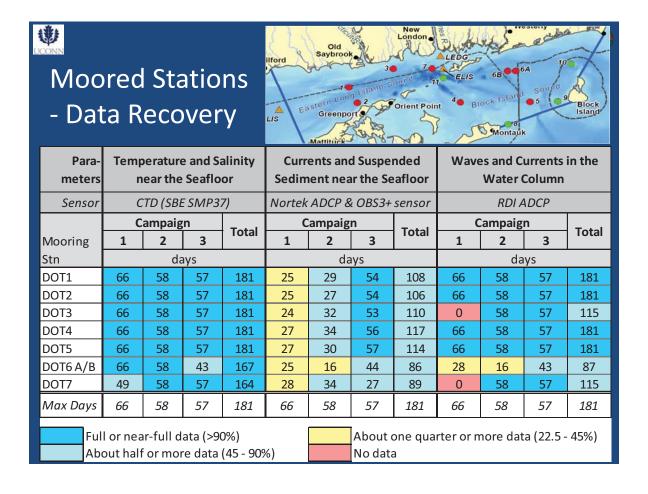
- · CTD for temperature and salinity
- Water sampler and optical instruments for future sediment transport modeling



Example of a cruise track for ship surveys. The track varied for each cruise due to weather conditions and sea state.



Rosette sampler, equipped with a profiling CTD, Niskin bottles, and various optical sensors and particle analyzers.

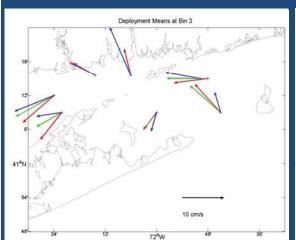






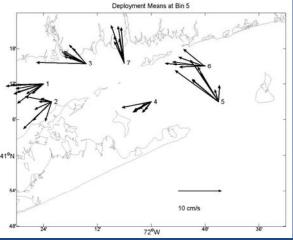


RDI ADCP means at ~3m from seafloor



Mean currents at Bin 3 of the RDI ADCP measurements during Campaigns 1 (green), 2 (red), and 3 (blue).

Nortek ADCP means at ~0.6m from seafloor



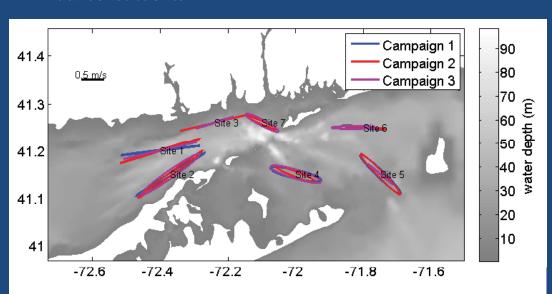
Mean velocity vectors at each moored station from the Nortek ADCP near the seafloor. The velocity scale is shown on graphic.

UCONN

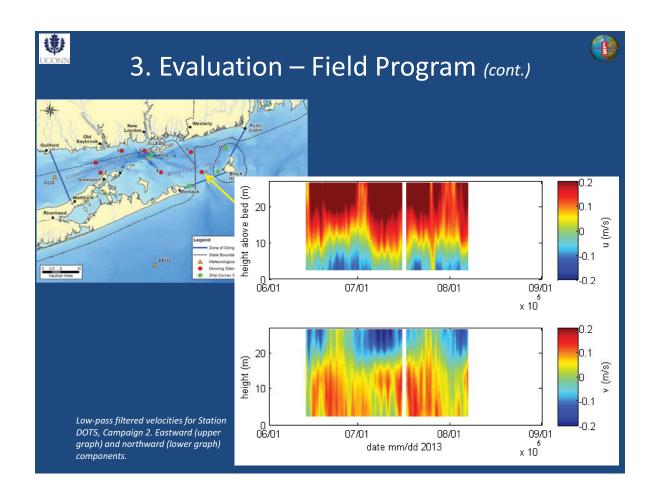
3. Evaluation – Field Program (cont.)

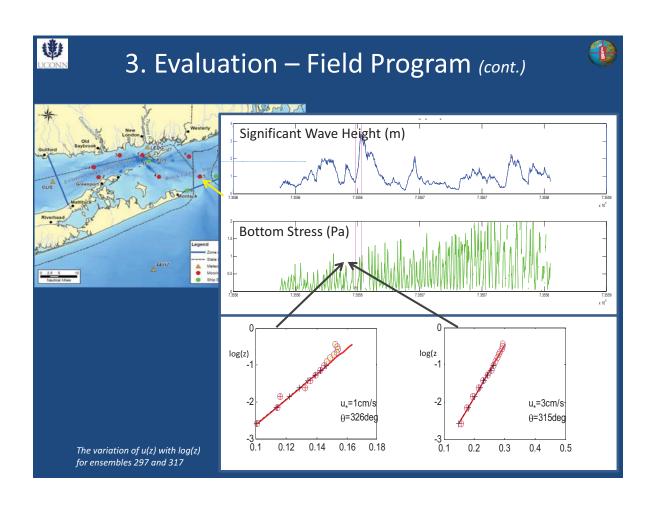


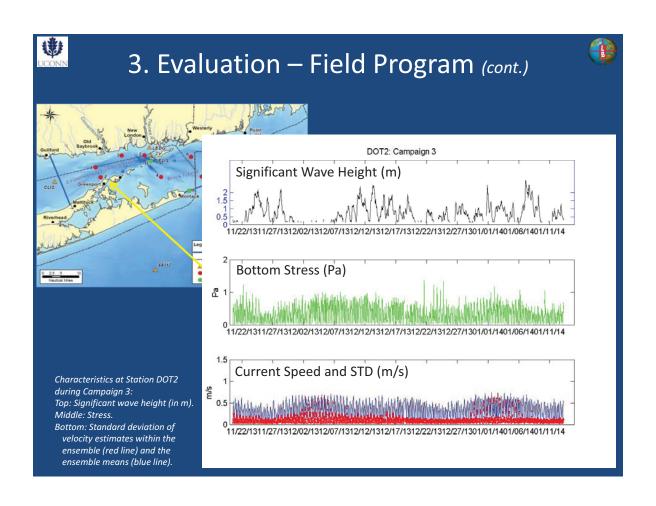
M2 Tidal Constituents

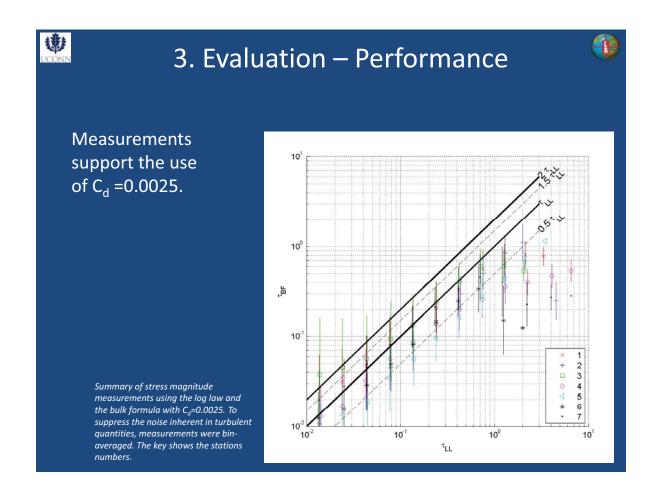


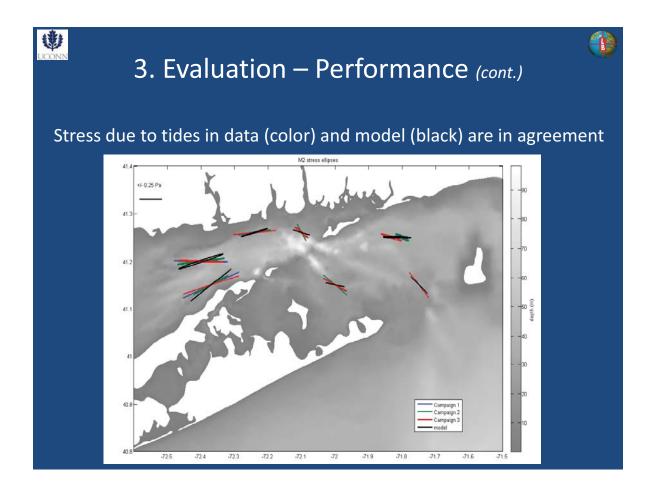
M2 ellipses for depth-average velocities from RDI ADCP measurements from the three campaigns (colors) and for FVCOM model (black) at all seven DOT stations. The grey shading represents mean water depth.

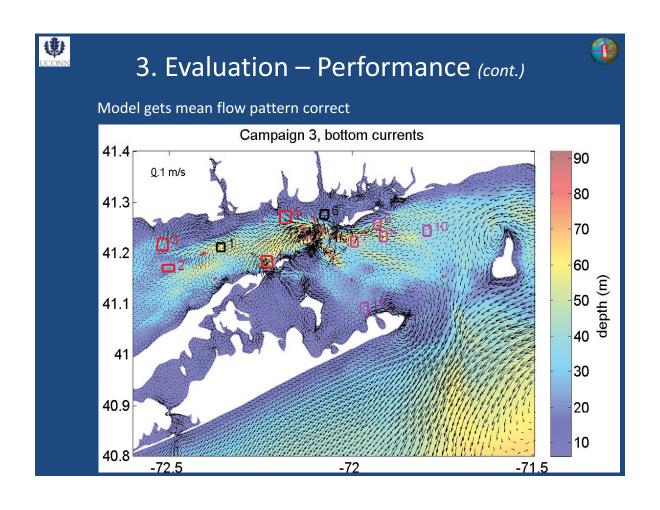






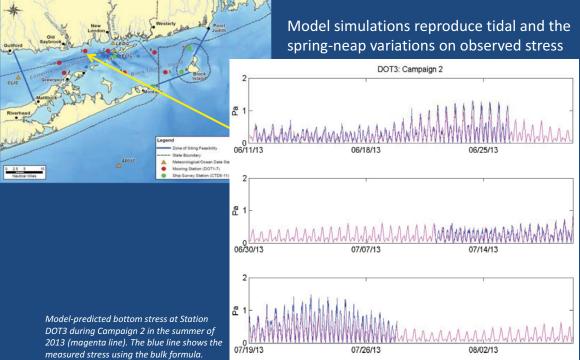










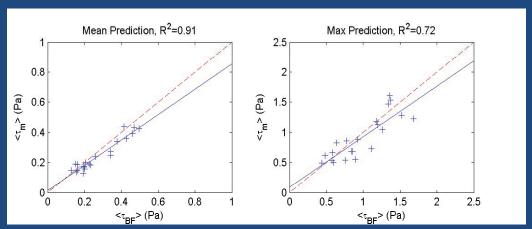


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3. Evaluation — Performance (cont.)

- Model and observations agree on the campaign mean and maximum stress magnitudes.
- Model can effectively discriminate between places where the maximum measured stresses are large (>1 Pa) and those where they are smaller (<1Pa).



Left: Comparison of model predicted bottom stress magnitudes and mean bottom stress observed during the three campaigns. Points would all lie on the red dashed line if the model and data were in perfect agreement. The blue solid line shows the ordinary least-squares regression line which has a correlation coefficient of 0.91.

Right: Comparison of the predicted and observed maximum stress magnitudes. The correlation coefficient was 0.72.

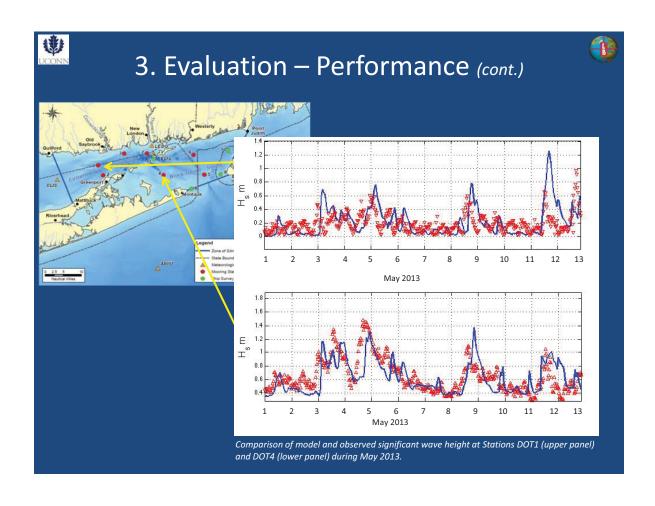






Model simulations reproduce tidal and spring-neap variations on observed stress

Model Stress (Pa) Observation Stress Magnitude								
Station	Mean	Max	Mean Max Correlation		Correlation	Lag (hrs) RMSE* MA		MAE**
Campaign 1								
DOT1	0.36	1.18	0.43	1.18	0.87	0.33	0.18	0.13
DOT2	0.43	1.28	0.50	1.52	0.85	0.33	0.24	0.16
DOT3	0.24	0.88	0.26	0.92	0.92	0.33	0.10	0.07
DOT4	0.17	0.50	0.20	0.60	0.89	0.38	0.07	0.05
DOT5	0.19	0.82	0.16	0.64	0.47	0.38	0.16	0.12
DOT6	0.15	0.49	0.13	0.44	0.86	-0.31	0.06	0.05
DOT7	0.14	0.69	0.16	0.84	0.65	0.67	0.12	0.08
Campaign	2							
DOT1	0.44	1.61	0.41	1.36	0.82	0.36	0.18	0.14
DOT2	0.39	1.22	0.46	1.68	0.67	0.67	0.28	0.20
DOT3	0.27	1.04	0.34	1.26	0.89	0.59	0.16	0.11
DOT4	0.19	0.55	0.23	0.89	0.83	0.76	0.12	0.09
DOT5	0.19	0.73	0.23	1.11	0.52	0.62	0.19	0.14
DOT6	0.19	0.62	0.15	0.48	0.84	0.42	0.08	0.06
DOT7	0.16	0.69	0.20	0.86	0.63	0.31	0.14	0.10
Campaign 3								
DOT1	0.34	1.47	0.38	1.34	0.79	0.84	0.19	0.13
DOT2	0.43	1.53	0.47	1.37	0.72	1.00	0.26	0.19
DOT3	0.25	1.12	0.34	1.20	0.83	0.50	0.17	0.11
DOT4	0.17	0.66	0.20	0.58	0.81	0.76	0.09	0.06
DOT5	0.20	0.86	0.21	0.77	0.65	-2.19	0.14	0.10
DOT6	0.15	0.53	0.16	0.58	0.66	0.16	0.09	0.06
DOT7	0.13	0.54	0.19	0.75	0.68	0.50	0.16	0.11

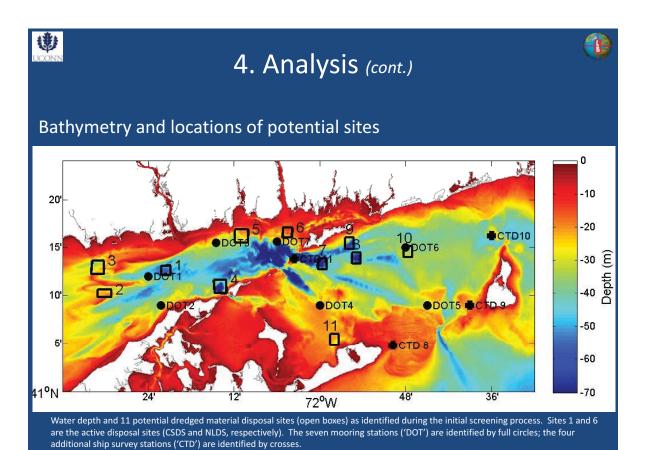






4. Analysis

- Find maximum bottom stress magnitude at each point in the ZSF in the three Campaigns
- Compare values at sites identified in the screening process
- Simulate period of a severe storm (Superstorm Sandy) and compare maximum stress magnitudes



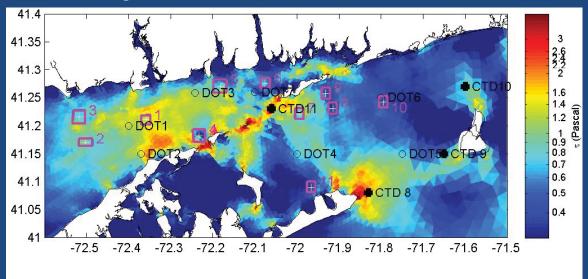




4. Analysis (cont.)

- Spatial differences are much larger than seasonal variations
- Stress is high in much of ZSF

current constituents and the seasonal mean flow, as well as wind).





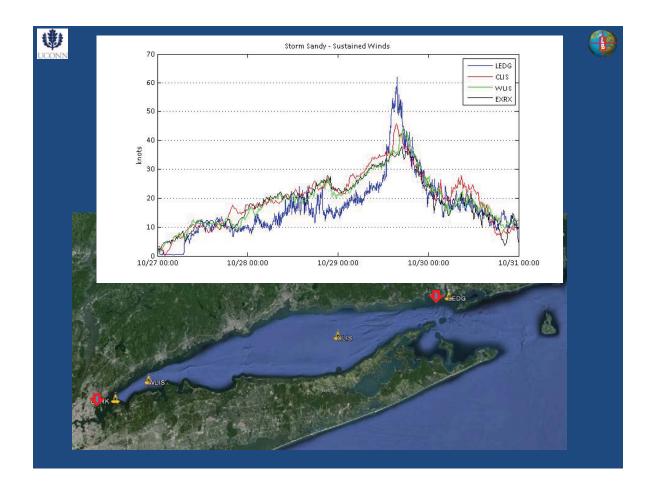


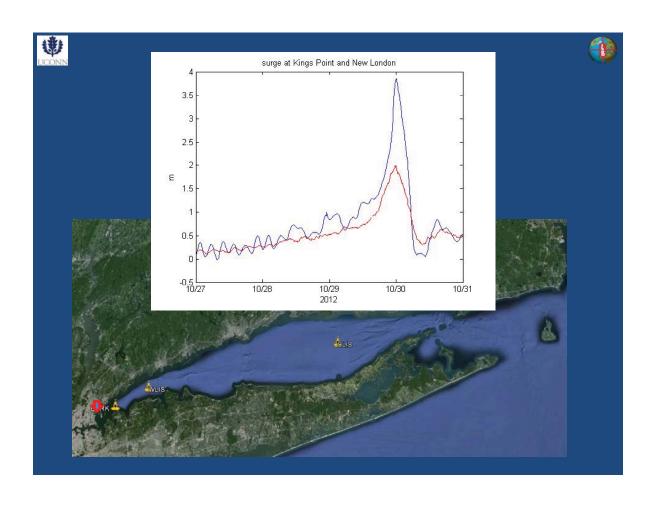
Maximum bottom stress during Campaign 3 (November 20, 2013, to January 16, 2014) for storm conditions (i.e., due to the principal tidal

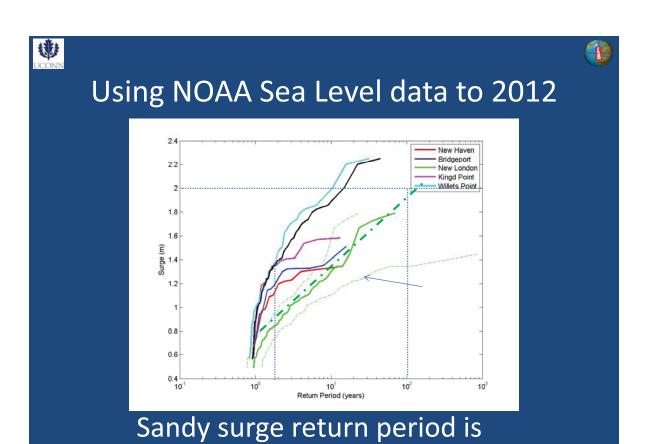


Maximum Bottom Stress (Pa) during Storm Conditions at Potential Dredged Material Disposal Sites

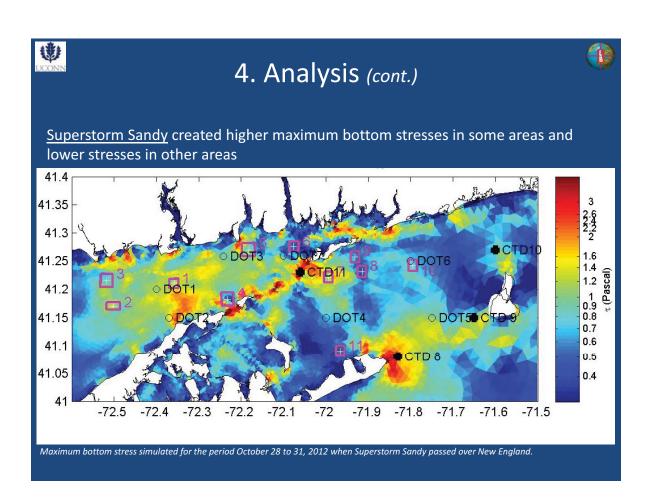
Potential Disposal Site		Maximum Bottom Stress (Pa)			Change in Maximum Bottom Stress during Storm Conditions relative to Fair-weather Conditions			
		1. (spring)	2. (summer)	3. (winter)	1. (spring)	2.(summer)	3. (winter)	
	1	Cornfield Shoals Disposal Site	1.17	1.31	1.24	-7%	-8%	-5%
	2	Six Mile Reef Disposal Site	0.92	1.09	1.00	-7%	6%	-8%
ELIS	3	Clinton Harbor Disposal Site	0.72	0.71	0.81	6%	14%	1%
E	4	Orient Point Disposal Site	0.52	0.61	0.48	61%	21%	7%
	5	Niantic Bay Disposal Site	0.73	0.97	0.84	-8%	19%	-2%
	6	New London Disposal Site	0.60	0.70	0.69	33%	31%	29%
	7	Fishers Island-west	0.79	0.91	0.86	-5%	8%	17%
BIS	8	Fishers Island-east	0.49	0.51	0.39	12%	-5%	-9%
	9	Fishers Island-center	0.39	0.50	0.38	20%	36%	15%
	10	Block Island Sound Disposal Site	0.49	0.63	0.44	6%	9%	-12%
	11	North of Montauk	0.31	0.31	0.34	0%	5%	-7%







~100 years at New London







4. Analysis (cont.)

Potential Disposal Site			Superstorm Sandy Conditions			
			Bottom Stress (Pa)	Change in Bottom Stress in 'Sandy' relative to Fair-weather Conditions in Campaign 3	Change in Bottom Stress in 'Sandy' relative to Storm Conditions in Campaign 3	
	1	Cornfield Shoals Disposal Site	1.16	-11%	-6%	
	2	Six Mile Reef Disposal Site	1.26	16%	25%	
ELIS	3	Clinton Harbor Disposal Site	0.87	9%	8%	
	4	Orient Point Disposal Site	0.53	17%	9%	
	5	Niantic Bay Disposal Site	0.99	16%	19%	
	6	New London Disposal Site	0.48	-10%	-30%	
	7	Fishers Island-west	1.17	58%	35%	
BIS	8	Fishers Island-east	0.46	5%	16%	
	9	Fishers Island-center	0.55	69%	47%	
	10	Block Island Sound Disposal Site	0.73	49%	68%	
	11	North of Montauk	0.39	6%	14%	





4. Analysis (cont.)

Stress Threshold for Erosion on Seafloor:

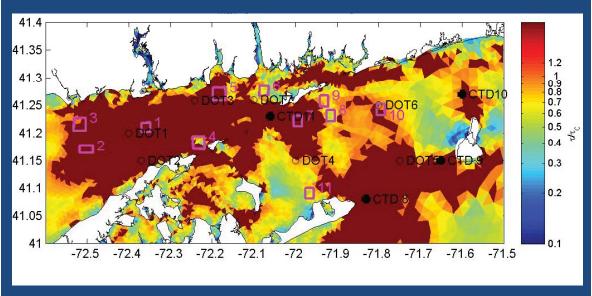
- Defined as the level of stress at which dredged material in a disposal area will be mobilized
- Depends upon sediment grain size, fraction of clay, volume fraction, level cohesiveness
- Based on a review of the literature, we choose
 0.75 Pa as the design threshold





4. Analysis (cont.)

Brown areas show values of maximum bottom stress greater than threshold.



Areas with maximum bottom stress exceeding the 0.75 Pa threshold during the simulation of Superstorm Sandy (screened as a uniform brown layer). Areas with bottom stress below 0.75 Pa are scaled (see color key on the right).





4. Analysis (cont.)

Comparison of Maximum Bottom Stress (Pa) for Potential Dredged Material Disposal Sites in the simulations of the three Observation Campaigns and Superstorm Sandy.

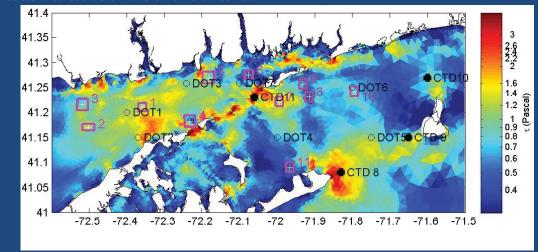
		Pot	ential Disposal Site	Maximum Stress in Simulations (Pa)		
ELIS	BIS	No.	Site Name	Group	Highest Value	
•		1	Cornfield Shoals Disposal Site		1.31	
•		2	Six Mile Reef Disposal Site	>1	1.26	
	•	7	Fishers Island-west Disposal Site		1.17	
•		5	Niantic Bay Disposal Site	0.75-1.0	0.99	
•		3	Clinton Harbor Disposal Site	0.75-1.0	0.87	
	•	10	Block Island Sound Disposal Site		0.73	
•		6	New London Disposal Site		0.69	
	•	9	Fishers Island-center	<0.75	0.55	
•		4	Orient Point Disposal Site	<0.75	0.53	
	•	8	Fishers Island-east		0.46	
	•	11	North of Montauk		0.39	





5. Summary

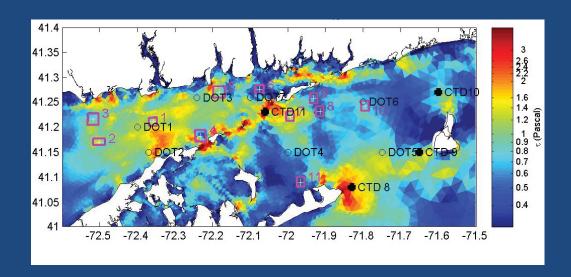
- Model results explain measured bottom stress variations in space and time with errors that are substantially less than the differences between the maximum stresses at the 7 field sites.
- Site 6 (New London DS) is the only site in Eastern Long Island Sound with maximum bottom stress below the 0.75 Pa threshold.







• Sites 8, 9 and 11 (Fishers Island center and east, and North of Montauk) in Block Island Sound show maximum bottom stress below 0.75 Pa threshold.



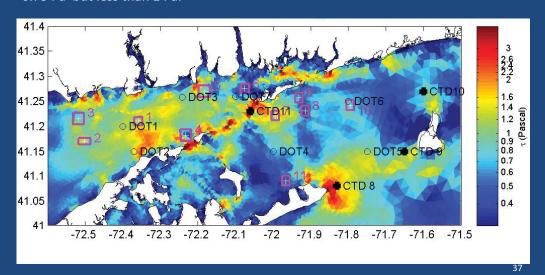




5. Summary

Sites 4 and 10 (Orient Point DS and Block Island Sound DS) show maximum stress below the 0.75 Pa threshold at the center of the site, but have values in excess of 0.75 Pa within the boundary.

Sites 5 and 3 (Niantic Bay and Clinton Harbor) show maximum stresses exceeding 0.75 Pa but less than 1 Pa.

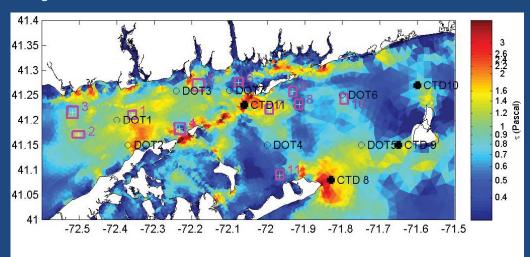






5. Summary

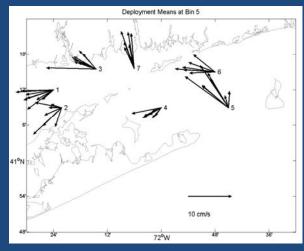
Sites 1, 2, and 7 (Cornfield Shoals, Six Mile Reef, and Fishers Island - west) have high maximum stresses.







5. Summary



Mean Flow is westward at all sites

20

Appendix A-10

TRIBAL CONSULTATION LETTERS



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region 1 5 Post Office Square, Suite 100 Boston, MA 02109-3912

July 15, 2015

Rodney Butler, Chairman Mashantucket Pequot Tribal Office Indiantown Road, P.O. Box 3060 Mashantucket, CT 06339-3060

Dear Chairman Butler:

The United States Environmental Protection Agency (EPA-Region 1) will release a draft Supplemental Environmental Impact Statement (SEIS) for the potential designation of long-term dredged material disposal sites for use in eastern Long Island Sound. Through this effort, we have an extensive public involvement program which includes the participation of federal, state, local government representatives serving as Cooperating Agencies.

The purpose of this letter is to inform you of the release of a draft SEIS for eastern Long Island Sound and to gauge your interest in government-to-government consultation, per the *EPA Policy on Consultation and Coordination with Indian Tribes*, prior to the final decision and rulemaking to be issued by EPA Region 1.

If you would like to discuss this further or wish to engage in government-to-government consultation, please contact Jean Brochi at 617-918-1536 by July 31, 2015. If we do not receive a response from you by this date, we will assume that you do not wish to pursue consultation on this matter and EPA Region 1 will move forward with its decision.

Sincerely,

Ken Moraff, Director

Office of Ecosystem Protection

Lynne a. Harry



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region 1 5 Post Office Square, Suite 100 Boston, MA 02109-3912

July 15, 2015

Kevin Brown, Tribal Chairman Mohegan Tribal Office 13 Crow Hill Road Uncasville, CT 06382

Dear Tribal Chairman Brown:

The United States Environmental Protection Agency (EPA-Region 1) will release a draft Supplemental Environmental Impact Statement (SEIS) for the potential designation of long-term dredged material disposal sites for use in eastern Long Island Sound. Through this effort, we have an extensive public involvement program which includes the participation of federal, state, local government representatives serving as Cooperating Agencies.

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Sincerely,

Ken Moraff, Director Company Office of Ecosystem Protection



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region 1 5 Post Office Square, Suite 100 Boston, MA 02109-3912

July 15, 2015

Matthew Thomas, Chief Narragansett Indian Tribe P.O. Box 268 Charlestown, RI 02813

Dear Chief Thomas:

The United States Environmental Protection Agency (EPA-Region 1) will release a draft Supplemental Environmental Impact Statement (SEIS) for the potential designation of long-term dredged material disposal sites for use in eastern Long Island Sound. Through this effort, we have an extensive public involvement program which includes the participation of federal, state, local government representatives serving as Cooperating Agencies.

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Sincerely,

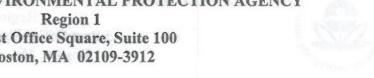
Ken Moraff, Director

Office of Ecosystem Protection



NITED STATES ENVIRONMENTAL PROTECTION AGENCY

5 Post Office Square, Suite 100 Boston, MA 02109-3912



July 15, 2015

Bryan Polite, Chairman Shinnecock Indian Nation Tribal Office P.O. Box 5006 Southampton, NY 11969

Dear Chairman Polite:

The United States Environmental Protection Agency (EPA-Region 1) will release a draft Supplemental Environmental Impact Statement (SEIS) for the potential designation of long-term dredged material disposal sites for use in eastern Long Island Sound. Through this effort, we have an extensive public involvement program which includes the participation of federal, state, local government representatives serving as Cooperating Agencies.

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Sincerely,

Lynne a. Har Ken Moraff, Director So

Office of Ecosystem Protection